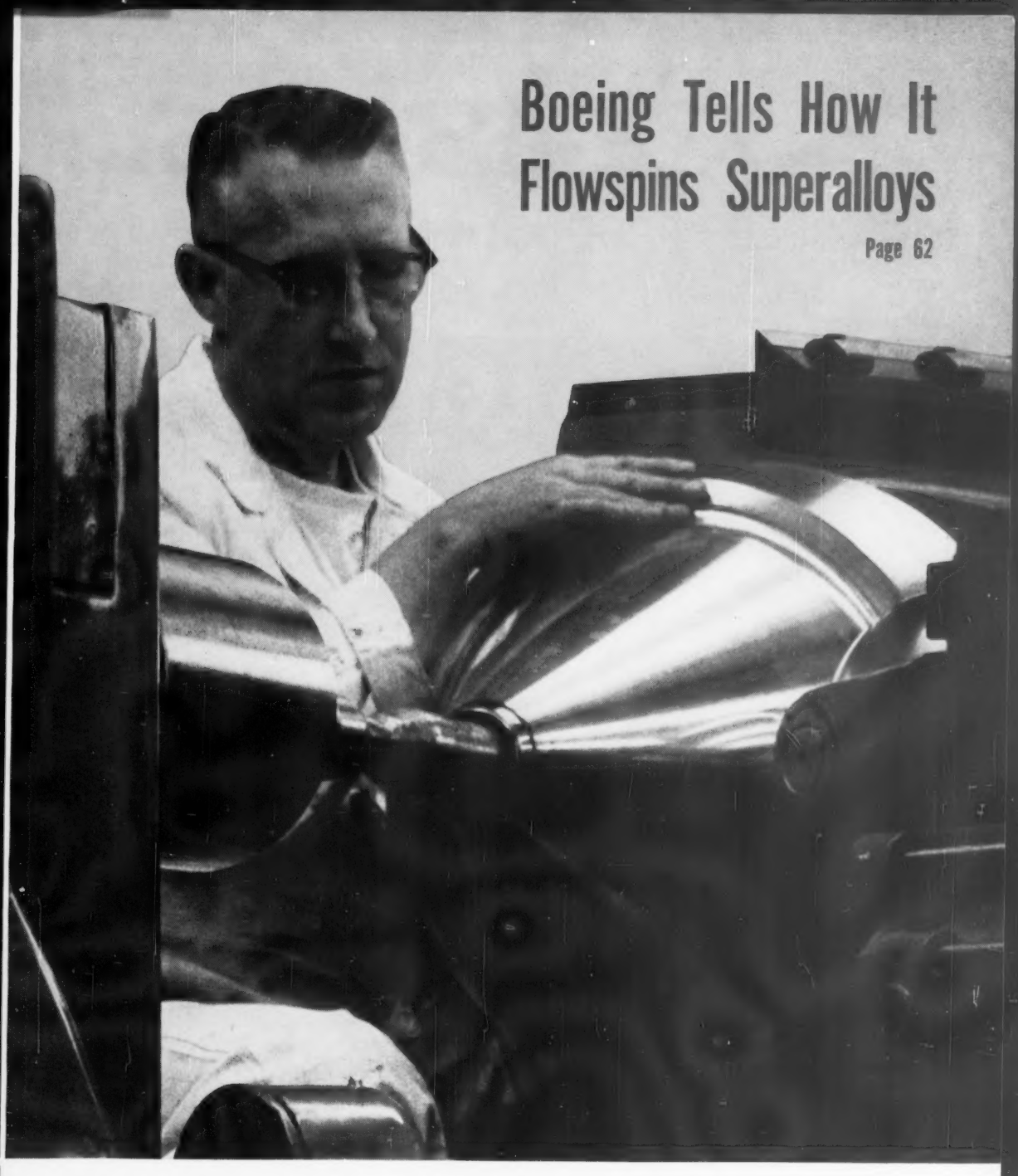
STEEL
The Metalworking Weekly
A PENTON PUBLICATION
FEBRUARY 20, 1961

Boeing Tells How It Flowspins Superalloys

Page 62



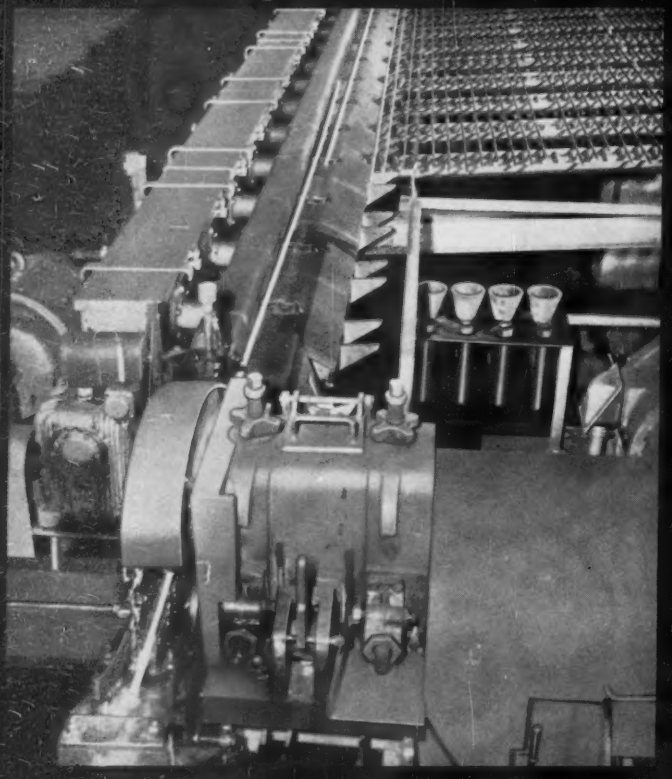
Plastic Laminates: Competitor, Ally 41
Where Automatic Assembly Pays Off . . 66
How Computer Helps Monitor Quality . . 76
Steel Service Center Sales Pick Up 93

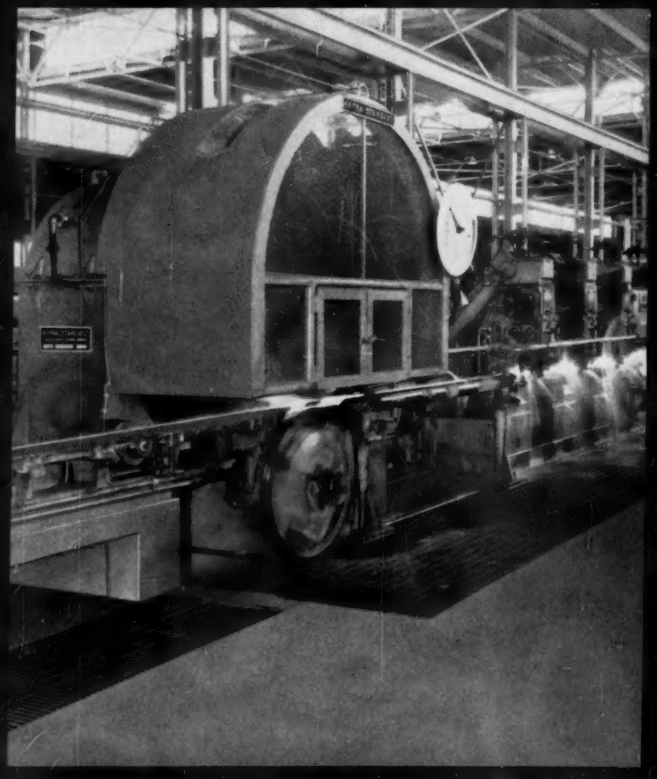
METALWORKING WEEK—PAGE 17
COMPLETE CONTENTS—PAGE 19

2 REASONS... FOR

HIGH-SPEED PRODUCTION OF PIPE... (Small diameter)

by C. W. Mills, E. W. Mills, Seamless or Stretch Reducing





ROTARY KICKOUT

- Transfers pipe to Cooling Beds at high speeds.
- Simple mechanical design.
- No great gap required between pipe lengths.
- Pipes are staggered in Kickout and come to a complete rest in Kickout before being transferred onto the Cooling Bed.

ROTARY FLYING HOT SAW

- Cuts any desired length at close length tolerances.
- Length of cut can be changed at full mill speed.
- Runs continuously at high speeds.
- 24 Rotary Flying Saws in successful operation. Latest saw has been tested by actual running at speeds of 2000 F.P.M. and higher.

Aetna-Standard Division • 300 Sixth Avenue • Pittsburgh 22, Pennsylvania

OTHER FEATURES OF AETNA-STANDARD PIPE MILLS:

Stretch Reducing—Simple and rugged design allows fast changing of mill.

Cooling Beds—Screw type with Cooling Tanks. Automatic pipe handling for dividing of pipe and cropping if desired.

Uncoilers—Automatic handling of coils. No manual labor required.

Aetna-Standard Division

BLAW-KNOX

Steel

for Strength
. . . Economy
. . . Versatility

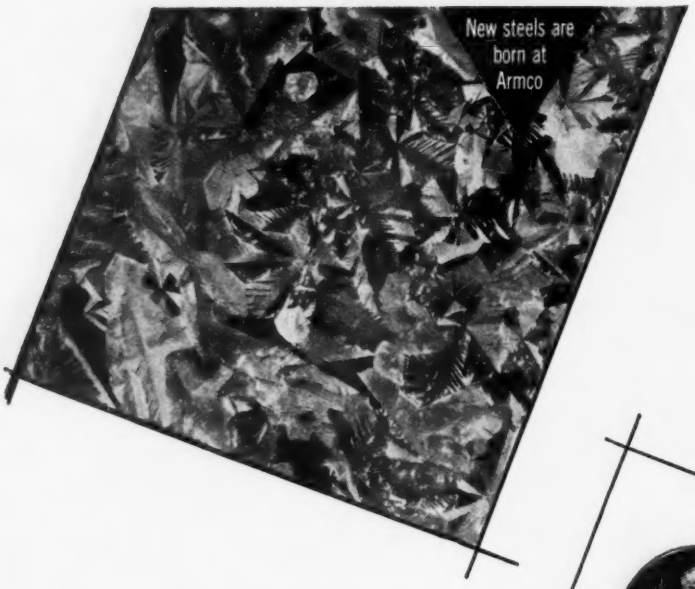
Casting... or Forging?

From the look of it, most people would probably guess casting. But it's a forging. Which proves a point. Many parts *look* too complicated for forging, but actually aren't. By careful selection of parting line, close trimming, and punch-outs, we're often able to forge parts you'd never expect to obtain as forgings. If you have such a part (and would welcome the strength and economy of forgings), send us a finished print. We'll be glad to study it and tell you frankly whether or not we can forge it. If we can, you can count on us for fast delivery.

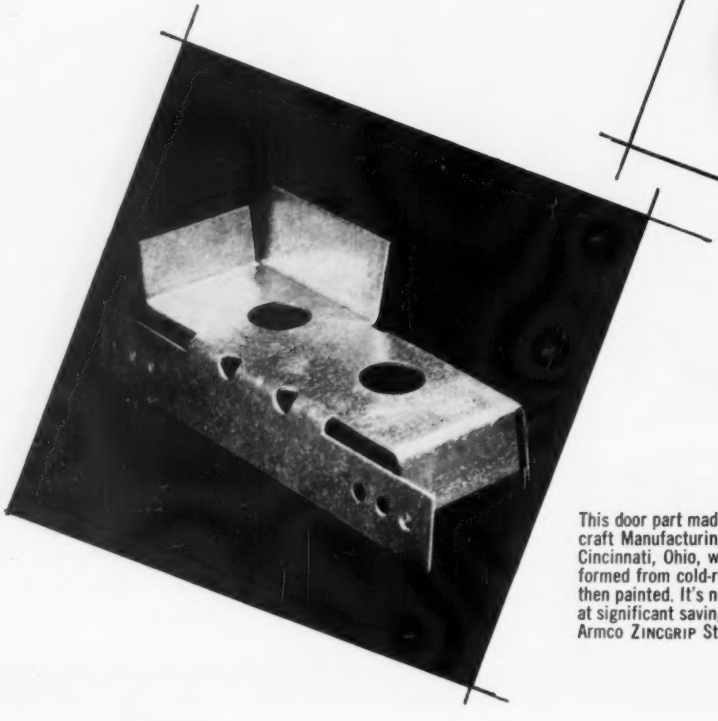
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Coating on



This door part made by Steelcraft Manufacturing Company, Cincinnati, Ohio, was previously formed from cold-rolled steel, then painted. It's now fabricated, at significant savings, from Armco ZINCGRIP Steel.

ZINCGRIP gives products durable protection at average cost of about 2⅓¢ per square foot

Can you match this with painting or plating?

Unseen structural parts are often protected from corrosion by painting or plating cold-rolled or hot-rolled steel. Yet with Armco ZINCGRIP® Steel, you can give your products the durable protection of a full-weight two-side coating of zinc at an *average cost of about 2⅓ cents per square foot.* Important cost savings are realized daily by manufacturers who take advantage of this economical protection.

Severe fabrication is no obstacle. You can work mill-coated ZINCGRIP to the limit of its ductile steel base. The tight zinc coating will not flake or peel.

If you paint or plate for protection from corrosion, it will pay you to investigate Armco ZINCGRIP Steel. Let us help you compare your costs for a painted or plated steel part with costs for the same part made from durable ZINCGRIP. Just fill in and mail the coupon.

Armco Division • Armco Steel Corporation
1171 Curtis Street, Middletown, Ohio
So that I can check savings with Armco ZINCGRIP—
☐ Send me your Application Data Bulletin
☐ Have an Armco Representative call

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

Steel

Use this label to identify your products made of strong, durable steel.

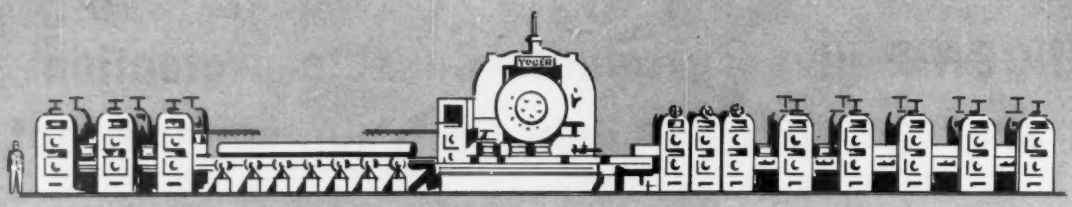
Check these cost comparisons

Steel Thickness	Cost of* ZINCGRIP Coating c/sq. ft. of sheet	Typical** Cost of Painting c/sq. ft. of sheet	Savings with ZINCGRIP c/sq. ft.
.025	1.83c	3.25c	1.42c
.050	2.72	3.25	.53
.075	2.51	3.25	.74
Average . . .	2.35c	3.25c	.90c

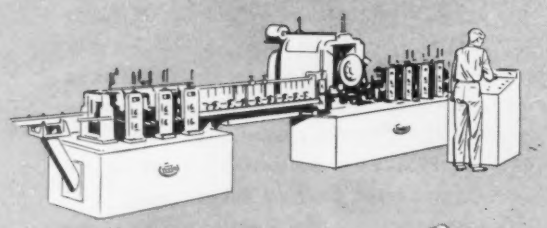
*Coated both sides **Painted both sides

Computations based on coils 24″ to 36″ wide. ZINCGRIP coating costs are additional costs beyond price of cold-rolled steel. Due to variations between thicknesses, cost of zinc coating in table varies somewhat even though it's the same full-weight coating. Paint costs are figured on typical dip-painting or flow-coating methods and include cost of metal preparation, paint, labor and overhead of painting operations. Some paint costs are lower than these; many are more.

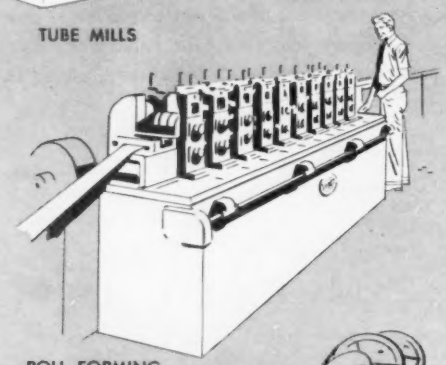
ARMCO **Armco Division**



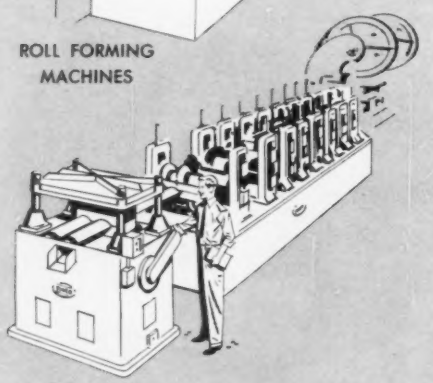
PIPE MILLS



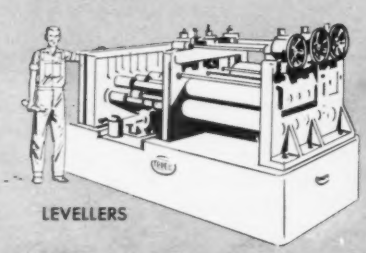
TUBE MILLS



ROLL FORMING MACHINES



CUT-OFFS



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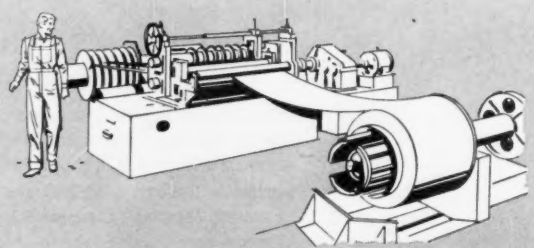

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ENGINEERING **YODER** MANUFACTURING

PIPE AND TUBE MILLS (ferrous or non-ferrous)
COLD ROLL FORMING MACHINES
ROTARY SLITTING LINES

Top Man in December

The top winner in STEEL's Usership Idea of the Month contest in December was S. J. Cole (right), sales manager, Industrial Nut Corp., Sandusky, Ohio. He became Honorary Editor No. 17 and was given a check for $500 and a stainless steel plaque. Walt Campbell, editor of STEEL, made the presentation in our editorial offices.

For more on Mr. Cole's entry, see Page 37 for a roundup on fasteners. The editors found it so interesting that they practiced usership too and incorporated it into an article.

Two-Time Winners

Two records were established in December: 18 entrants were Honorable Mention winners; and four were repeat winners. The judges named the four to honorary editorships. No. 18 is Alexander Schelkun, chief draftsman, Wheel & Brake Plant, Troy, Ohio, B. F. Goodrich Aviation Products Div., B. F. Goodrich Co. (an April, 1960, winner); No. 19 is William Novak, Tool & Die Design, Ceco Steel Products Corp., Chicago (an October, 1960, winner); No. 20 is Leon Eriv, metallurgist, Eastern Laboratory, Newark, N. J., Canco Div., American Can Co. (a November, 1960, winner); No. 21 is Donald C. J. Gray, factory manager, Hastings Equity Grain Bin Mfg. Co., Hastings, Nebr. (also a November winner).

14 Strike Pay Dirt

The other Honorable Mention winners are: E. W. Anderson Jr., account executive, Marsteller, Rickard, Gebhardt & Reed Inc., Pittsburgh; Bill D. Beasley, purchasing director, Chatleff Controls Inc., Austin, Tex.; L. R. Bloetscher, sales manager, Metal Door & Frame Div., United Steel Fabricators Inc., Wooster, Ohio; Al Cerney, plant superintendent, Robot Mfg. Corp., San Diego, Calif.; Charles F. Christ, operations research engineer, Saginaw Steering Gear Div., Saginaw, Mich., General Motors Corp.; C. C. Griffith, manager, Mfg. Engineering Processing & Procurement, Car & Truck Assembly Group, Chrysler Corp., Detroit; T. W. Haiplik, work simplification supervisor, Production Engineering, Thompson Products Ltd., St. Catharines, Ont.; George A. Kulis, foreman, U. S. Steel Supply Div., San Francisco, U. S. Steel Corp.; Louis Lawrence, manufacturing engineer, Clarksville Mfg. Div., Clarksville, Tenn., Trane Co.; Donald A. Mackay Jr., assistant advertising manager, Heald Machine Co., Worcester, Mass., a subsidiary of Cincinnati Milling Machine Co.; W. T. Rouse, manager-engineering, Thomas Industries Inc., Ft. Atkinson, Wis.; P. B. Sobacki, New Products Research & Development, Stewart Die Casting Div., Stewart-Warner Corp., Chicago; Norton D. Sokolow, production manager, Henry Soss & Co., Los Angeles; R. Glen Woods, general manager, Jo-Line Tools Inc., South Gate, Calif.

$8000 Awarded

Though December marks the final Usership contest, results are by no means complete. Each top winner has six months in which to take a crack at a second award of $500. So far, five winners have collected $1000 apiece, out of a total of $8000 awarded in the contests.

The latest to collect his second $500 is A. L. Lauer of General Motors Corp.'s Saginaw Steering Gear Div.

Now It Can Be Told

With the Usership contest over, we rushed for an interview with the judges, Associate Managing Editor John Morgan, News Editor Bill Dean, and Metallurgical Editor Ed Case.

They report they based their evaluation of each entry on these points:

1. Originality in the use of a STEEL article or ad.
2. Significance of the use.
3. Clarity and brevity of the entry.

The clearest, shortest, and most ingenious entry did not win. The judges ruled that the use was insignificant. The entrant devoted 17 words to telling how the Dec. 26 issue had the right thickness for evening up the short leg on his TV set.

STEEL, the metalworking weekly, is selectively distributed without charge to qualified management personnel with administrative, production, engineering, or purchasing functions in U. S. metalworking plants employing 20 or more. Those unable to qualify, or those wishing home delivered copies, may purchase copies at these rates: U. S. and possessions and Canada, $10 a year; all other countries, $30 a year; single copies, 50 cents. Metalworking Yearbook issue, $2. Published every Monday by The Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

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to give up a few hours a year for a health checkup?

Your best cancer insurance is a thorough checkup every year, and alertness to Cancer's 7 Danger Signals.

Learn how to guard yourself against cancer. Write to "Cancer" in care of your local post office, or call your nearest office of...

American Cancer Society

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...Fluid Power news

1921 1961 OILGEAR 40 Years of Fluid Power

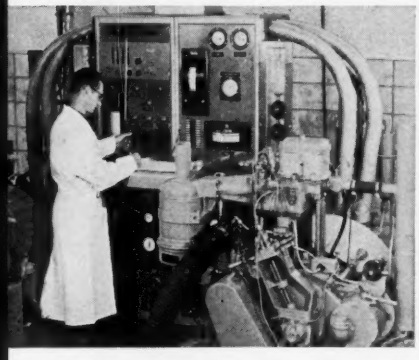
Report No. 12,400 From Oilgear *Application-Engineering* Files

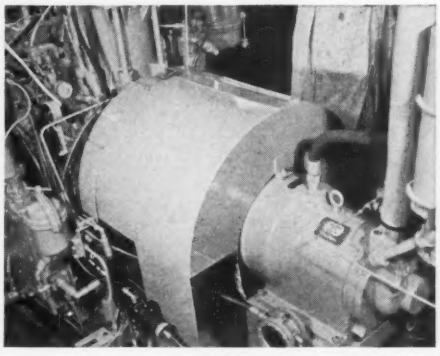
HOW OILGEAR-ESSO RESEARCH TEAMWORK SOLVED NEED FOR MORE COMPACT, LOWER COST, RELIABLE, HIGHLY ACCURATE, DYNAMOMETER AND STARTER SYSTEMS

USER: *Esso Research and Engineering Corp., Linden, New Jersey*

PROBLEM: New Equipment to conduct the exhaustive, standardized performance tests on all new fuels and lubricants, as required by the oil companies and engine manufacturers — to guarantee top-quality petroleum products for optimum consumer engine performance. These extended tests — carefully recorded and regulated from operating control centers — are performed with *standard test* engines coupled to load-absorbing dynamometers. Cradled, expensive electrical load absorbers were previously used to provide test engine control.

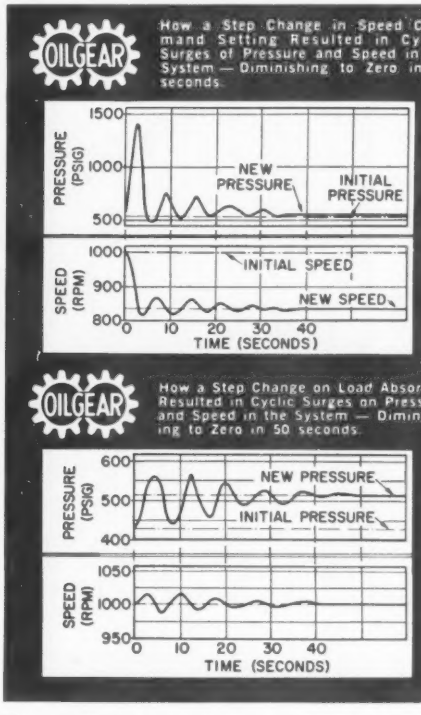
ESSO RESEARCH REQUIREMENTS FOR A NEW DYNAMOMETER SYSTEM WERE: 1. Sharply reduce installed cost and valuable test floor space. 2. Insure absolutely reliable, precise, loading and speed control over continuous periods up to 1,000 hours per test. 3. Simplify test engine starting methods — normally 50-hp motors are used to overcome high starting torques, due to heavy flywheels and high internal friction. 4. Long life, maximum trouble-, and maintenance-free durability.





LEFT: One of the Oilgear-Esso Research centralized control centers for complete recording, regulation, control, and operation of two test engines, and the Oilgear servo-valve-controlled Dynamometer and Starters connected to them. **RIGHT:** Rear view of 5¾" bore by 8" stroke, Standard Single Cylinder Test Engine with Oilgear servo-valve-controlled Dynamometer/Starter. This efficient, compact, Oilgear pump/motor unit is shaft-coupled to the test engine . . . cranks the engine for starting — then absorbs all power produced during testing. Other system equipment — Oilgear servo-valve "Power Paks" that regulate the loads imposed on the test engines and Oilgear remote, air-controlled Type "DA" Variable Displacement Pump used for starting the test engines — are mounted on the floor above to free valuable test floor area for additional testing units.

SERVOCONTROL* — Single-Stage, Four-Way Servo Valve without enclosure . . . exclusive "Swing-Plate" design . . . only one moving part . . . no metal-to-metal contact . . . as used with this installation.
*A Division of The Oilgear Company



SOLUTION: A completely new servo-valve-controlled *Dynamometer and Starting System* was *Application-Engineered* by Oilgear's Servocontrol Division. In addition to meeting all engine control and starting requirements, these new systems were installed *at 50% of the cost of comparable "universal" electric dynamometer systems.* Addition of two more test units to this system will result in a saving of 65% for the four-ganged arrangement. The unusual, centralized starting system has adequate capacity to start a large number of test engines — one at a time — and maintain the required supercharge on the dynamometer pump/motors during test-loading. Oilgear loading Pump/Motors permit more compact installations than equivalent capacity alternate systems. Simple safety interlocks protect the equipment, and guarantee positive, correct operating sequence of all starting and loading test procedures.

ESSO RESEARCH REPORTS — *"Other than installed cost and space saving, the prime requirement of this dynamometer was to maintain a constant speed for variations in temperature, engine torque, etc. This system maintains an accuracy of 1 rpm at an engine speed of 1000 rpm — or a speed accuracy of 0.1%.*

Information contained in this Fluid Power News Report is condensed from a paper entitled, "Electro-Hydraulic Dynamometer and Starter for Laboratory Test Engine" — by J. W. Broome, Chief Engineer, Servocontrol Division of The Oilgear Company, and R. L. Van Voorhies, Senior Engineer, Mechanical Division, Esso Research and Engineering Company . . . presented at the NCIH — Chicago, Illinois. OILGEAR — SERVOCONTROL are trademarks of The Oilgear Company.

By sizing the hydraulic equipment to torque and speed required, these same fundamental components can be applied to other dynamometer applications . . . and for controlling other variables. OILGEAR-SERVOCONTROL can supply *everything* a carefully engineered system requires . . . reduce delays, costly machine downtime due to malfunctioning, and actually save you money on engineering, components wiring, piping, installation and testing costs — PLUS the assurance that only a "single-source, single-responsibility" can give.

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Know both to keep your steel costs low

You know steel is low in cost. How can you *keep* it that way? One way is never to forget that there's more to *final* cost than initial price. Hidden—and unnecessary—costs of possession, like handling, storing, cutting, taxes and insurance often creep in. Recognize these added expenses.

Each steel user's case is different. Your steel service center will be glad to help you determine the most economical way to buy steel. Figure all your costs of possession, such as:

Cost of capital:	Cost of operation:	Other costs:
Inventory	Space	Obsolescence
Space	Materials handling	Insurance
Equipment	Cutting & burning	Taxes
	Scrap & wastage	Accounting

Call your nearby steel service center, or write for free booklet, "What's Your Real Cost of Possession for Steel?"

STEEL SERVICE CENTER INSTITUTE

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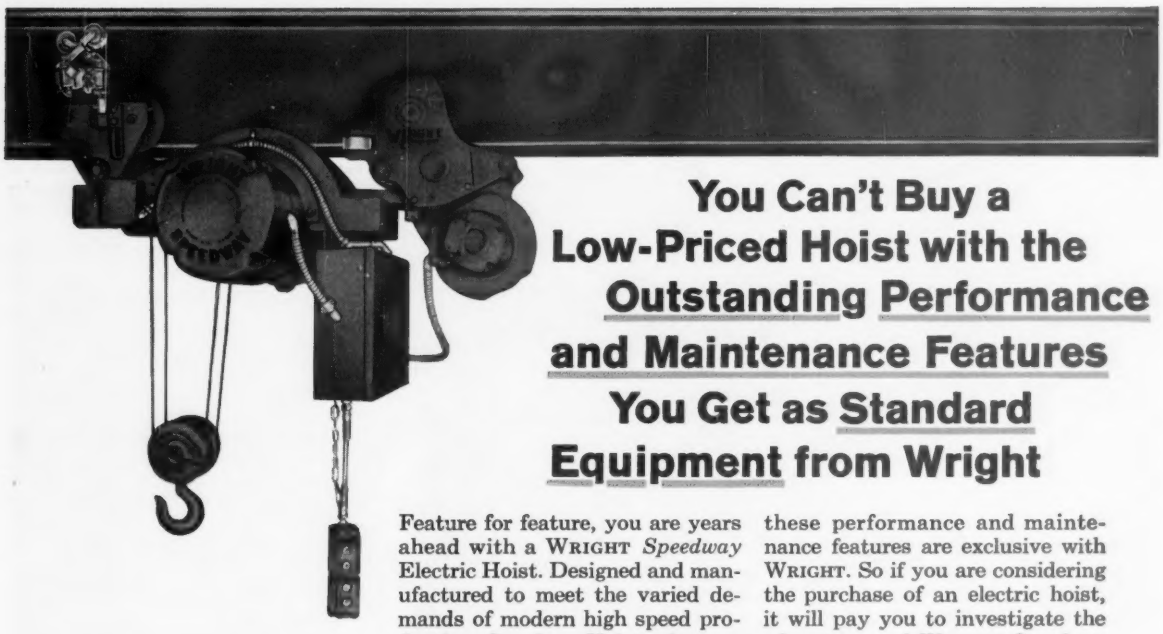
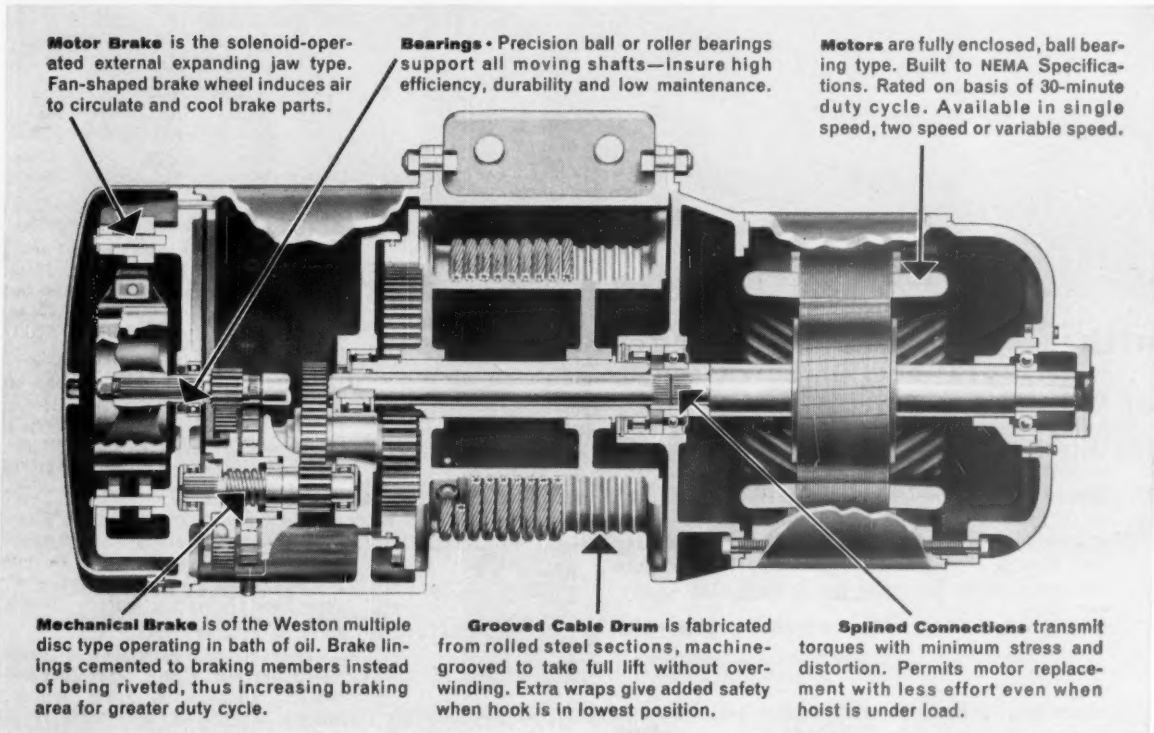


You Can't Buy a Low-Priced Hoist with the Outstanding Performance and Maintenance Features You Get as Standard Equipment from Wright

Feature for feature, you are years ahead with a WRIGHT *Speedway* Electric Hoist. Designed and manufactured to meet the varied demands of modern high speed production, *Speedway* Hoists give you the safety, adaptability, ruggedness and efficiency which you can't get in a low-priced hoist. Many of these performance and maintenance features are exclusive with WRIGHT. So if you are considering the purchase of an electric hoist, it will pay you to investigate the advantages of WRIGHT *Speedway* Hoists. For complete information, write our York, Pa., headquarters for **Catalog E-58.**


Motor Brake is the solenoid-operated external expanding jaw type. Fan-shaped brake wheel induces air to circulate and cool brake parts.
Bearings • Precision ball or roller bearings support all moving shafts—insure high efficiency, durability and low maintenance.
Motors are fully enclosed, ball bearing type. Built to NEMA Specifications. Rated on basis of 30-minute duty cycle. Available in single speed, two speed or variable speed.
Mechanical Brake is of the Weston multiple disc type operating in bath of oil. Brake linings cemented to braking members instead of being riveted, thus increasing braking area for greater duty cycle.
Grooved Cable Drum is fabricated from rolled steel sections, machine-grooved to take full lift without overwinding. Extra wraps give added safety when hook is in lowest position.
Splined Connections transmit torques with minimum stress and distortion. Permits motor replacement with less effort even when hoist is under load.

See your WRIGHT Distributor *about the Speedway Electric Hoist line in the ¼ to 10-ton capacity range*

WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

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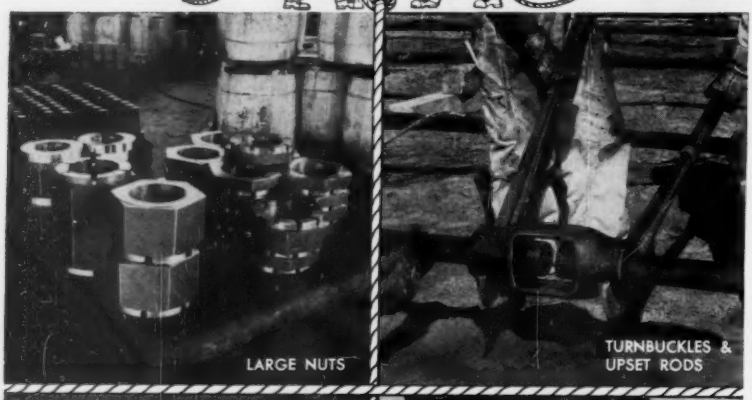

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DYSON LARGE FASTENERS are uniquely qualified to help you tie together large construction jobs. These giant fasteners (1¾" bolt diameter and up) are real cost-savers, speeding up assembly of large construction and machinery units. Made in our own plant under the supervision of Dyson large fastener specialists, they offer unequalled ease of assembly and high strength factors to provide positive fastening. For details on the wide variety of Dyson large fasteners available, write for Bulletin 160 today.

NEW BULLETIN ON LARGE FASTENERS

Every engineer needs this free digest of large fasteners.

Joseph Dyson & Sons, Inc., 5155 St. Clair Ave., Cleveland 3, Ohio, HE 1-6157

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CALENDAR
OF MEETINGS

Feb. 26-Mar. 2, Metallurgical Society of AIME: Annual meeting, Ambassador and Chase-Park Plaza Hotels, St. Louis. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: R. W. Shearman.

Feb. 27-Mar. 1, Association of Iron & Steel Engineers: Western meeting, Hotel Statler-Hilton, Los Angeles. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

Mar. 5-8, American Road Builders Association: Annual convention and exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J. Association's address: 600 World Center Bldg., Washington 6, D. C. Executive vice president: L. W. Prentiss.

Mar. 5-9, American Society of Mechanical Engineers: Gas turbine power conference and exhibit, Shoreham Hotel, Washington. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

Mar. 6-8, American Management Association: Data processing conference and exhibit, Statler-Hilton Hotel, New York. Association's address: 1515 Broadway, New York 36, N. Y.

Mar. 7-9, Material Handling Institute: Spring meeting of MHI and the Industrial Truck Association, Sheraton Blackstone Hotel, Chicago. Information: Hanson & Shea, 1 Gateway Center, Pittsburgh 22, Pa.

Mar. 11-15, National Association of Secondary Material Industries Inc.: Annual convention, Fairmont and Mark Hopkins Hotels, San Francisco. Association's address: 271 Madison Ave., New York 16, N. Y. Administrator: M. J. Mighdoll.

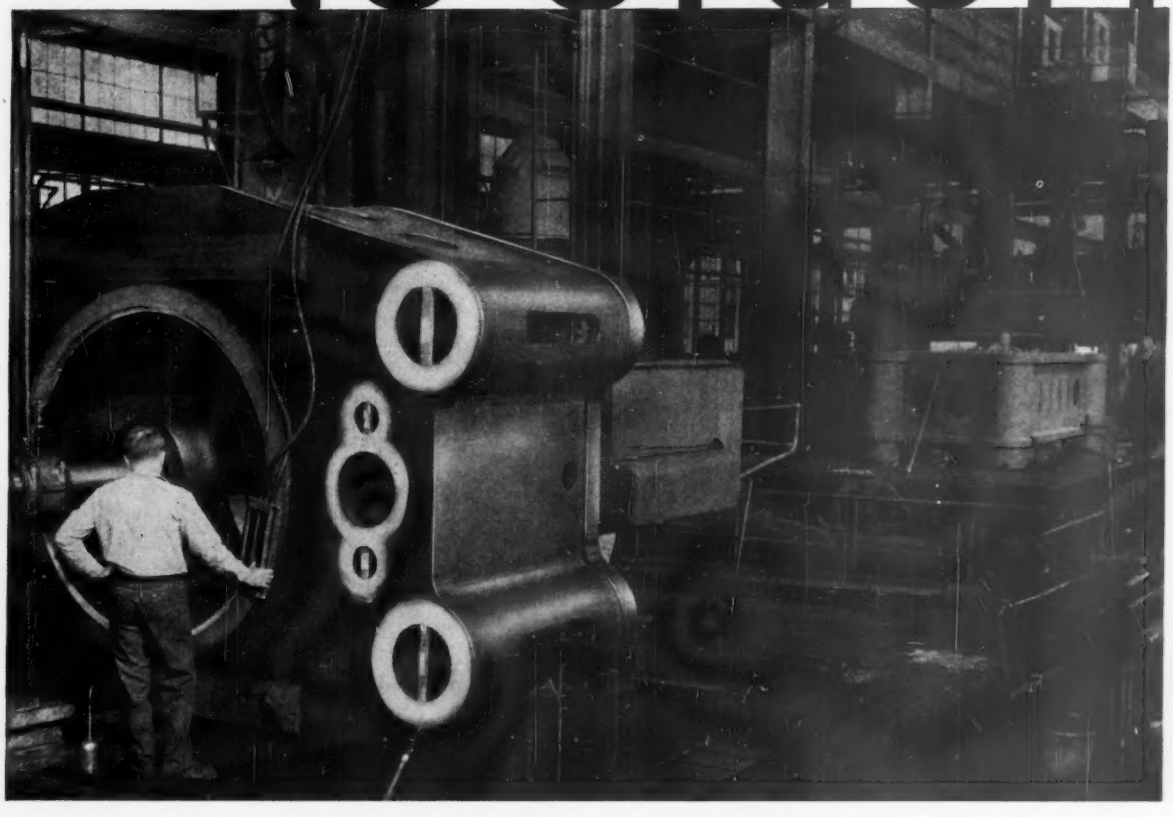
Mar. 13-14, Steel Founders' Society of America: Annual meeting, Drake Hotel, Chicago. Society's address: 606 Terminal Tower, Cleveland 13, Ohio. Executive vice president: F. Kermit Donaldson.

Mar. 13-17, Society of Automotive Engineers Inc.: National automobile meeting, Sheraton-Cadillac Hotel, Detroit. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: Joseph Gilbert.

Mar. 13-17, National Association of Corrosion Engineers: Annual convention and exhibit, Statler-Hilton Hotel, Buffalo. Association's address: 1061 M&M Bldg., Houston 2, Tex. Executive secretary: T. J. Hull.

Mar. 13-17, Industrial Diamond Association Inc.: Annual meeting, Hollywood Beach Hotel, Hollywood, Fla. Association's address: 587A Newark-Pompton Turnpike, Box 175, Pompton Plains, N. J. Executive manager: Mrs. Margaret J. McGinnis.

Build exactly what you want
• • • to order!



VERSATILITY—that's the word for Sun Ship. And that's why you get the machinery or industrial equipment you need, built exactly to your requirements, when you specify Sun Ship.

Consider, for example, the machining operations shown above. To the left is a press cylinder being machined on a 72″ Draw-shaper and to the right is a large platen on a 14′ wide Planer. Here we custom-produce a wide variety of machinery or machine components to do difficult jobs in petroleum, chemicals, atomic power—in many fields.

If you would like to investigate the advantages of Sun Ship machine building service, why not contact our Sales Engineering Department now? For information and data on any phase of our service, simply write

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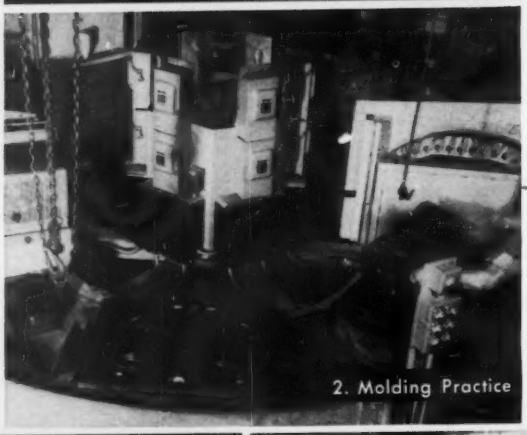
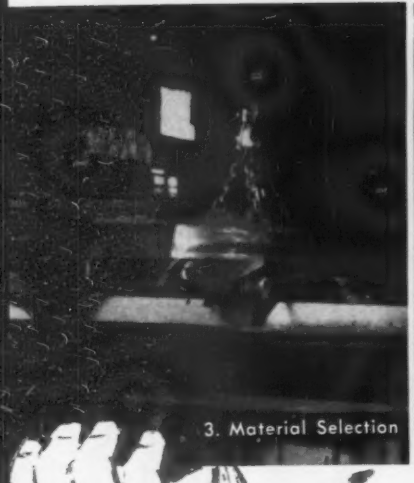
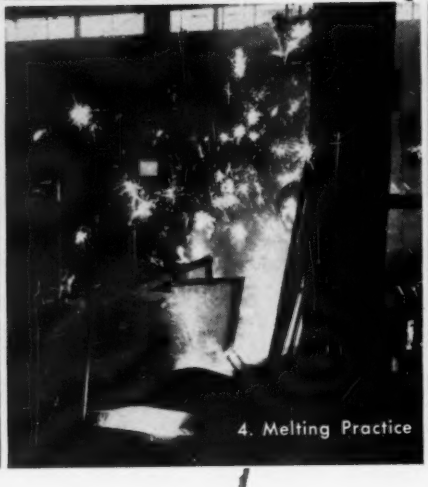
1. Pattern Making



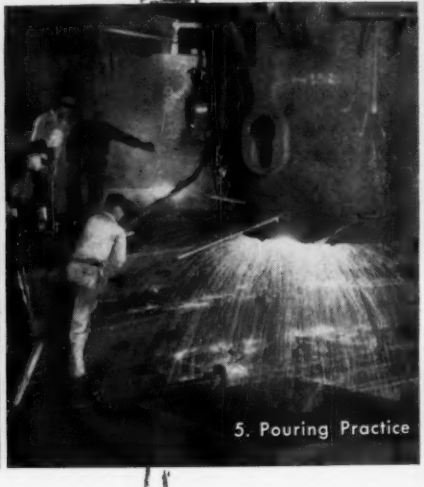
2. Molding Practice



3. Material Selection



4. Melting Practice



5. Pouring Practice

REPUBLIC FOUNDRY SERVICE ENGINEERS GIVE YOU MORE THAN METALLURGICAL HELP

From pattern making to finishing operations, Republic Foundry Service Engineers offer you more than metallurgical assistance.

These men, backed by their complete knowledge of metal behavior and practical foundry experience, are thoroughly qualified to assist you in every department of your foundry operation.

No pressure is applied to promote one grade of pig iron over another, because Republic produces the most complete line of pig iron in the industry. The Foundry Service Engineer recommends the grade best suited to your requirements, your equipment, your specifications. Northern grades include Chateaugay, Foundry, Malleable, Bessemer, and Basic. Southern furnaces produce Malleable, Foundry, and Basic.

To find out more about the latest processes and techniques for improving castings . . . for suggestions on increasing production efficiency . . . for ideas on increasing the use and sale of castings, mail coupon for a call by a Republic Foundry Service Engineer. Republic's Complete Foundry Engineering Service is available to all foundries without obligation.

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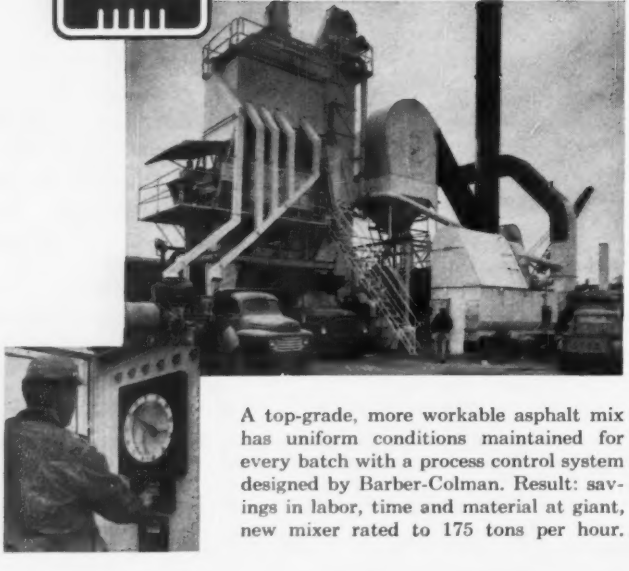

A top-grade, more workable asphalt mix has uniform conditions maintained for every batch with a process control system designed by Barber-Colman. Result: savings in labor, time and material at giant, new mixer rated to 175 tons per hour.

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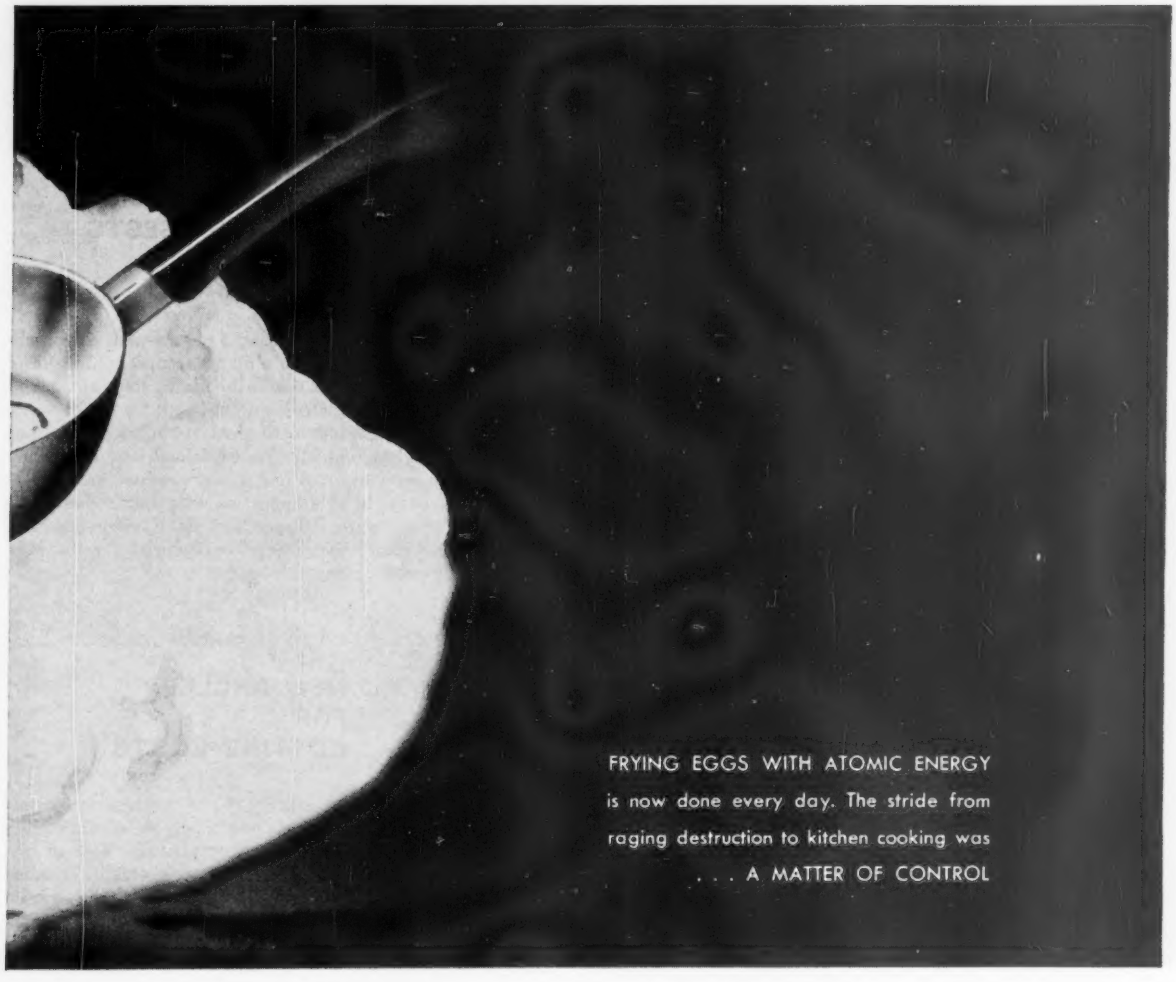
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PORTABLE "SERVICE CENTER"
sparks new ideas and savings

Hundreds of companies have saved money, improved products and cut production waste as the result of opportunities presented by the Ryerson "Metalogikit."

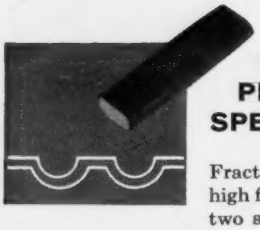
How? This unique kit is a veritable portable service center . . . lets you explore many alternatives to material you now use. For example, you can compare several different cutting methods on the same piece of steel to see which is best for your application.

Following are a few random examples showing how Ryerson specialists, using the "Metalogikit," have helped customers with a variety of problems—many similar to those you may face every day.

If you would like to put the Ryerson "Metalogikit" to work for you, call your Ryerson representative for a demonstration—for unbiased recommendations on steel, aluminum, plastics and metalworking machinery.

KIT SPOTS SAVINGS

Scratches and grooves normal to cold drawn, seamless tubing caused high manufacturing costs for a company making small, light-wall hydraulic cylinders. The small I.D. had to be honed to eliminate these faults—often too much metal was removed for proper piston fit. A Ryerson specialist suggested a switch to *welded tubing*. Using a sample from his "Metalogikit," he pointed out the better finish that eliminates expensive honing. The switch was made with these results: higher production, low reject rate, improved product, lower purchase price per foot of tubing.



KIT SUGGESTS PROFITABLE SPEC CHANGE

Fractures and rejects were extremely high for a manufacturer cold forming two severe bends in flat, hot rolled bars. A Ryerson specialist examined the ⅜" x 2" bar stock and compared it with a sample of M-1020 flattened round bar from his "Metalogikit." He explained how controlled carbon of Ryerson M-1020 bar would produce great cost-saving advantages in this operation over hot rolled, mild steel. After specs were changed to this Ryerson-supplied bar, fractures and rejects were substantially reduced—bringing new profitability.

NEW ANGLES FOR CUTTING COSTS

In making chairs, a furniture manufacturer was using *rolled* aluminum angles in 6061-T6 alloy where strength was not an important factor. A Ryerson aluminum specialist recommended using *extruded* angles in 6063-T5. Using a sample from his "Metalogikit," he pointed out that this angle would provide all the strength needed in the application, is more easily formed and has a better finish. The change in material was made—cutting costs 15¢ per unit produced.

STAINLESS FROM KIT LEADS TO SAVINGS

This company had an emergency requirement for stainless sheets. Application had always called for Type 304, 16 ga. x 66" x 81", *polished on one side*. Their Ryerson specialist questioned the need for polishing. From his "Metalogikit," he showed them a sample of 304 with a 2B finish. The company readily agreed it was exactly the finish needed *without polishing*—saving delivery time and material cost. The Ryerson man further suggested 16 ga. x 72" x 144", using the cutoff pieces for another job—reducing scrap waste on both requirements. Order was placed and delivered in plenty of time. Over-all result: a substantial saving.

STEEL • ALUMINUM • PLASTICS • MACHINERY

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Joseph T. Ryerson & Son Inc., Member of the INLAND® Steel Family

Forging Industry Is Ready to Re-equip, but

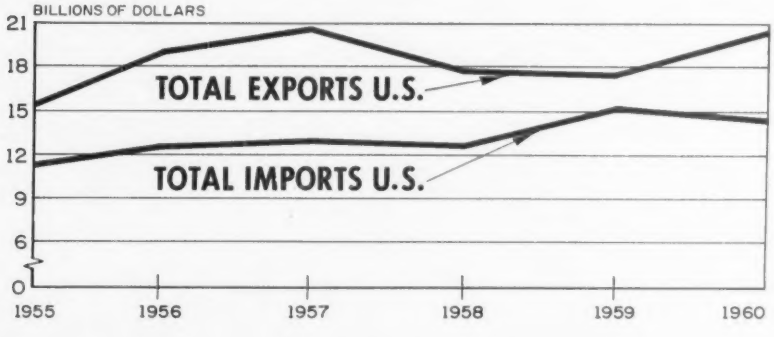
"Delays in depreciation reform stand in the way of a major re-equipping job in the forging industry," says Elmer W. Cress, president, Drop Forging Association and also president of Buchanan Steel Products Corp., Buchanan, Mich. Reform or not, the industry will spend upwards of $30 million on new plant and equipment this year, only slightly less than it did in 1960. Forging sales in the fourth quarter of 1960 surpassed third quarter volume by 13 per cent, and most forgers anticipate further improvement.

Damage Suits Against Electrical Firms Loom

The federal government and a number of cities are preparing a string of civil damage suits against the electrical firms involved in the price fixing cases. Justice Department attorneys and economists are studying the mass of material developed in the trials. The trustbusters said they were feeding information to state and municipal authorities to aid them in their damage suits.

'60 Balance of Trade Favors U. S. by $5.8 Billion

U. S. exports for 1960 topped $20.5 billion (exceeded only by record 1957) a 16 per cent gain over the 1959 pace, reports the U. S. Department of Commerce. Imports also nudged a near record—$14.7 billion, about 4 per cent less than the $15.2 billion high hit in 1959. The over-all decrease in imports during 1960 stemmed from drops in 8 of 11 commodity groups, including metals and manufactures and machinery and vehicles. For the balances from 1955 through 1960, see graph, below.



Credit Men See Economic Upturn in 2nd Quarter

"Gradual upturn in the second quarter of 1961, slow but noticeable," forecasts the National Association of Credit Management. "Many of the current economic weaknesses should be disappearing soon. Though retail sales are not

likely to show much improvement in the first quarter, a moderate but significant rise is expected in the spring." Following that forecast is a U. S. Department of Commerce report that shows retail sales in January declined 2 per cent from the previous month. The seasonally adjusted sales figure for the first month of 1961 totaled $17.7 billion. Lower automobile sales and smaller department store volume accounted for part of the drop.

Flowspinning Tackles Tough Superalloys

Forming superalloys is tricky. One solution, used by Boeing Airplane Co., Seattle, is flowspinning (often called power spinning). The company is spinning cylinders, cones, and other shapes needed in supersonic aircraft and missiles. The process cold forms ductile metal to the shape of a rotating mandrel, as shown in the photograph. Metal is plastically deformed and progressively displaced by heavy pressure from the rollers. For advantages, limitations, and rules, see the article on Page 62.

'You Auto Buy' Gets New Look

Last year's "You Auto Buy Now" car sales program got a new twist in the Shenango Valley area, near Sharon, Pa., last week. The Shenango Valley Auto Dealers Association, in co-operation with Sharon Steel Corp. and other metalworkers, conducted a "We Sell Steel" campaign to promote car sales. Advertising campaigns and displays told how car sales affect the jobs and livelihood of many—from steelmaker to auto mechanic to store clerk.

Are Table Top Computers on the Way?

Dr. Franz Huber, Republic Aviation Corp., Farmingdale, N. Y., holds a thin-film tunnel diode capable of working at room temperatures. The diode, one of the most widely used semiconductors, was formed by capturing titanium vapor on glass strips. The formation results in a film that's less than 1 millionth in. thick. Success of the experiments could mean the advent of table top computers and navigational units for aircraft and satellites that would be no larger than pocket-sized radios, say company officials.

Engineers' Earnings Continue Upward Trend

Salary levels for engineers rose about 5 per cent a year between 1958 and 1960 vs. an average annual increase of 6.5 per cent between 1953 and 1958, says the Engineering Manpower Commission of Engineers Joint Council, New York. Its survey of 200,000 engineering graduates shows the median annual salary now stands at $9600 compared with $6500 in 1953. The highest paid are in industry, followed by education then government.

Computer System Monitors Quality at Sylvania

Have you tried speeding the evaluation of product quality with a computer? Sylvania Electric Products Inc., a subsidiary of General Telephone & Electronics Corp., New York, tests electronic tubes with a semiautomatic device tied in with a computer. Result: Two people can do a better job than the eight formerly required. See Page 76.

Construction Contracts Hit All-time High

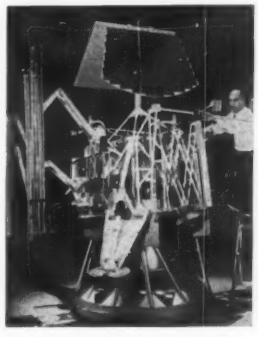
A burst of strength in the final months of the year sent 1960 construction contracts to an all-time high of $36.3 billion, reports F. W. Dodge Corp., New York. That figure, a fraction above the high set in 1959, marks the 14th year in a row that contracts have established records. Dodge Corp. notes that sharp gains in contracts for nonresidential buildings and heavy engineering construction late last year more than offset a poor showing by residential building.

Construction Put in Place Holds at Year Ago Level

The value of new construction put in place continues to hold steady. A preliminary estimate by the U. S. Department of Commerce sets the January, 1961, figure at $3.8 billion—approximately the same as in January, 1960. Revised estimates for calendar 1960 indicate that spending for new construction tallied $55.17 billion. The breakdown: $38.93 billion for new private construction and $16.24 billion for public.

Shooting for a Soft Landing on the Moon

A 750 lb payload, like this full scale model of the Surveyor spacecraft, is scheduled for a 6 mph landing on the moon's surface in the 1963-66 period. Pictured with the 11 ft model is Dr. Leo Stoolman, Surveyor Laboratory manager, Hughes Aircraft Co., Culver City, Calif., the company selected by the National Aeronautics & Space Administration for contract negotiations to build seven of the spacecraft. Instruments will report findings to earth and four television cameras will transmit pictures.



Plastic Laminates: Competitor, Ally

From setscrews to exit cones in rocket engines, that's the utility range of high pressure plastic laminates—fast becoming a competitor and ally to metalworking. At one time, 90 per cent of one company's output went into electrical insulating materials. Now it's 35 per cent. The big switch: Heavy movement into mechanical applications. Among the host of attributes cited for

STEEL The Metalworking Weekly

February 20, 1961 Vol. 148 No. 8

CONTENTS

THE EDITOR'S VIEWS:
Labor's Myopia 27

WINDOWS OF WASHINGTON:
Kefauver Plans Busy Session 38

MIRRORS OF MOTORDOM:
Colbert Strives for 'Tighter Ship' .. 47

THE BUSINESS TREND:
Buyers Point to Early Upturn 51

NEWS SECTION:
JFK Pushes Depreciation Reform .. 31
A Look at Heating in 1986 32
Electrospark Shapes Tough Metals .. 33
Saline Water Program Advances .. 34
Obsolescence Creates Crisis 36
Laminates: Competitors, Allies 41
Outlook for Thermonuclear Power .. 44
Natural Gas Fuels Blast Furnace .. 58

TECHNICAL SECTION:
Technical Outlook 61
Boeing Flowspins the Superalloys 62
Ways to Save with Cast Stainless .. 65
Evaluating Automatic Assembly ... 66
Machine Topics—Electron Beam Welder Cuts Metal 68
Progress in Steelmaking—Modern Tin Plate Plant Offers More Sizes 70
Jumbo Impellers Cast in CO_2 Molds 75
Computer System Monitors Quality .. 76

MARKET SECTION:
Market Outlook 91
Complete Index to News and Prices .. 91
Service Centers Move More Steel .. 93
District Ingot Rates and Chart 96
Steel Output Jumps 10 Per Cent .. 96
Scrap Price Composite Up $1 108
Stocks of Scrap Decline 109
Nonferrous Metals—Drought in Metal Sales Continues 112
Steel Shipments Gained in '60 115

DEPARTMENTS & INFORMATION:
Servicenter 5
Editorial and Business Staffs 6
Calendar of Meetings 10
Metalworking Week 17
Metalworking Pulse 20
Men of Industry 55
New Products 81
New Literature 88
Advertising Index 117

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Editorial Index available semiannually.

STEEL also indexed by Engineering Index, 29 W. 39th St., New York 18, N. Y.

the versatile plastics: High strength to weight ratio, low heat transfer, excellent corrosion resistance, ease of fabrication. See Page 41.

Wages in Building Trades Jump 4.2 Per Cent

The average wage rate for workers in seven major building trades is $3.70 an hour, reports the Bureau of Labor Statistics. In its quarterly (Jan. 3, 1961) survey in 100 cities, the Bureau found the increase in average union hourly scales since Jan. 4, 1960, amounted to 14.8 cents for all trades combined—a 4.2 per cent jump. From high to low, the averages are: Bricklayers, $4.22; plasterers, $4.09; electricians, $4.08; plumbers, $4.04; carpenters, $3.82; painters, $3.58; building laborers, $2.83.

USW Concedes Defeat on Cost of Living Boost

United Steelworkers have conceded defeat in attempts to win 3 cent an hour cost of living wage increases for 500,000 mill employees. The union withdrew from a scheduled arbitration proceeding which was to determine whether its members would get the boost (retroactive to Dec. 1) or any part of it under provisions of labor contracts signed in January, 1960.

Straws in the Wind

Total industry sales of room air conditioners, including exports, hit 1,521,300 units in 1960 vs. 1,660,300 in 1959, says National Electrical Mfrs. Association, New York . . . Federal Trade Commission has ordered Timken Roller Bearing Co., Canton, Ohio, to stop requiring exclusive handling of its products in the replacement market by its distributors and jobbers . . . Electronic Industries Association announces radio sales in 1960 totaled 10.7 million units, the highest since 1948 . . . 5.9 million television sets were sold in 1960 —about 200,000 more than in 1959 and the best total since 1957 . . . Lower manufacturing costs enabled General Electric Co. to reduce prices 41 cents on three industrial models of silicon unijunction transistors which are used in solid state relays, triggering, and switching devices . . . Admiral Sales Corp. plans to lease refrigerators, room air conditioners, ranges, and dishwashers to apartment house operators.

Metalworking Pulse

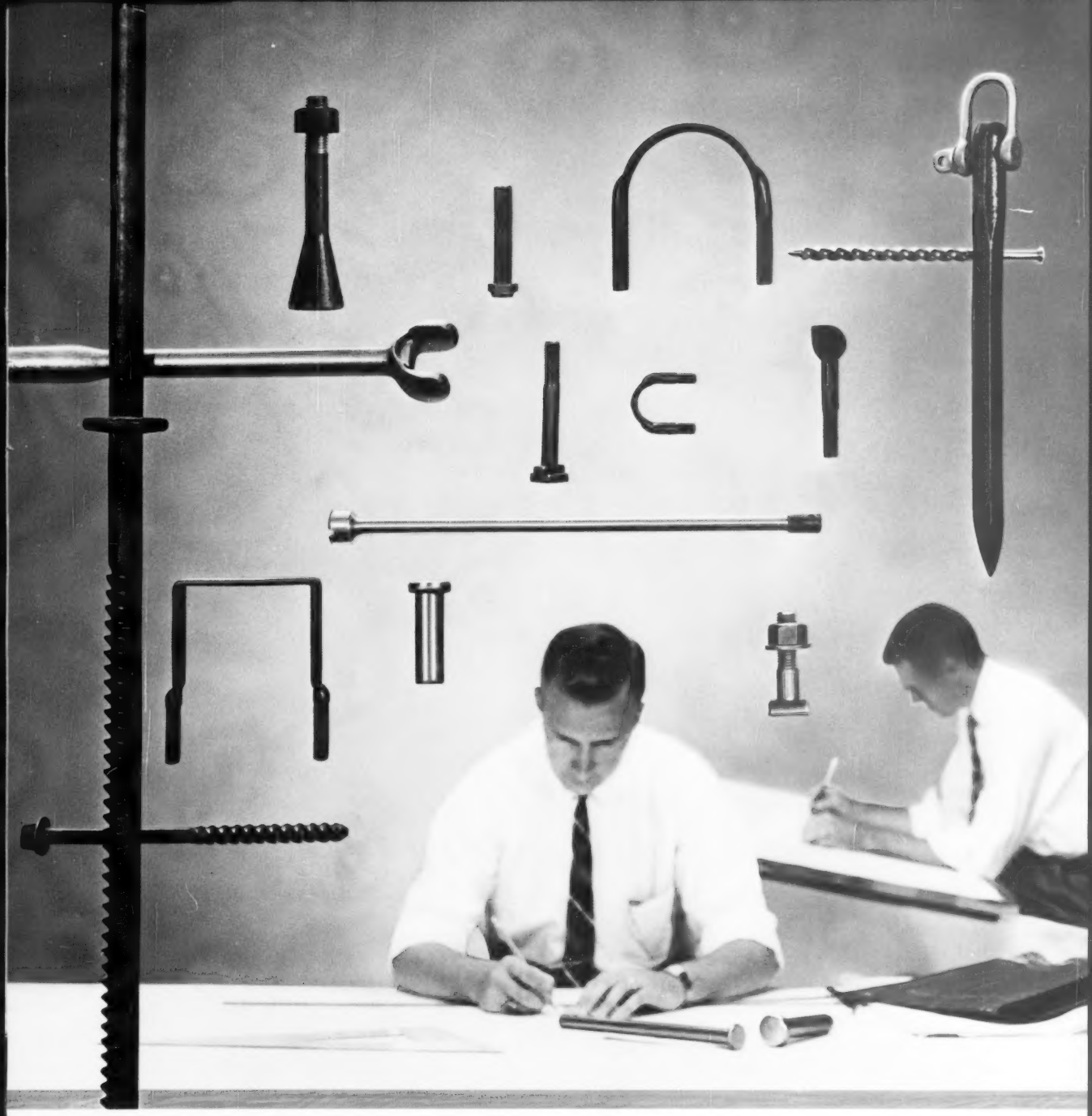
The Business Trend: Unusually high consumption of electricity caused by severe winter weather continues to hold STEEL's industrial production index on a plateau. **Autos:** Cutbacks in auto output are the rule, rather than the exception. Production is now only slightly better than it was during model changeover period last year. **Steel:** Production has risen for four consecutive weeks, reaching the highest level since last October.

- **INDUSTRIAL PRODUCTION INDEX** (1947-49=100)
  Week ended Feb. 11 .... 148†
  Year ago 179
  Details on Page 51

- **PASSENGER CAR OUTPUT (UNITS)**
  Week ended Feb 18 .. 65,000*
  Year ago 158,898
  Details on Page 48

- **STEEL INGOT OUTPUT (TONS)**
  Week ended Feb. 18 .1,540,000*
  Week ago 1,524,000
  Details on Page 96

†Preliminary. *Estimated.



Let us make your "specials"—

Headed . . . threaded . . .
punched . . . bent . . . forged . . .
rolled . . . machined . . .
heat-treated . . . coated

The design skills of Bethlehem's fasteners engineers have saved countless dollars for people using steel fasteners for special applications. Some of these specialty products are not fasteners at all, but *all* of them are produced in our fasteners plants at Lebanon, Pa., Seattle, South San Francisco, and Los Angeles.

Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL

BETHLEHEM STEEL

BETTER JOB AT HALF THE COST

OLD BOLT—This sleeve-type bolt was used as a steel strapping handle for railroad cars. The weld was expensive, and the part couldn't handle heavier loads.

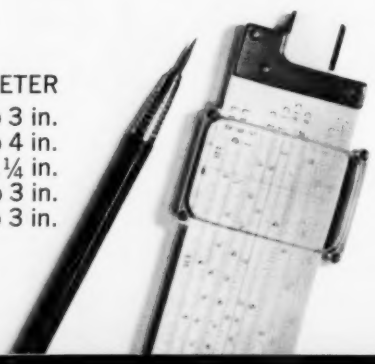
NEW BOLT—Bethlehem fasteners engineers designed this forged-eye bolt. Strength was greatly increased by new design and use of heavier material. And all this—at half the original cost.

Many special fasteners cost much more than they should. But if your steel "specials," like these, were redesigned by Bethlehem fasteners engineers, it's quite possible your costs would be cut substantially. We can design and make *any* component that can be upset, forged, or machined.

Bethlehem engineers

MANUFACTURING RANGES

PROCESS	DIAMETER
Roll-threading	¼ in. to 3 in.
Cut-threading	¼ in. to 4 in.
Cold-heading	¼ in. to 1¼ in.
Hot-upsetting	¼ in. to 3 in.
Bending	¼ in. to 3 in.



Steel

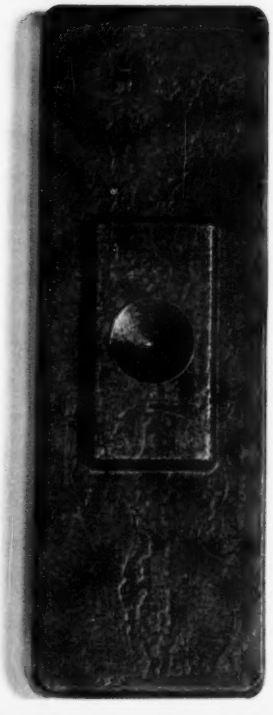
for strength
. . . economy
. . . versatility

COLD-FORGED AT CONSIDERABLY LESS THAN MACHINING COST

This intricate stud, used in a clutch mechanism, has an offset head. Originally turned from bar stock on a screw machine, it is now cold-forged in a Bethlehem fasteners plant at a substantial reduction over the original machining cost. The redesign for forging, which also resulted in a stronger, longer lasting part, was conceived by Bethlehem's experienced staff of fasteners engineers.

OUR PRICE IS LOWER THAN THE CUSTOMER'S COST

When our customer made this steel hook bolt (for holding concrete forms in place), his in-plant costs ran higher than our selling price. He used ¾-in. round stock, and his process required four operations. Redesigned by our engineers, it is now done in two quick steps on our specialized equipment. We used ⅝-in. stock, and upset it at one end to the required diameter.



WE ELIMINATED AN EXPENSIVE OPERATION

Bethlehem fasteners engineers bypassed a costly and exacting operation for this forged steel plate. When the customer drilled the part, he had to position the bit precisely for every hole. The suggestion, to forge "starter holes" right into the part, is an example of how our designers are constantly on the alert to create cost-saving improvements.

OUR EQUIPMENT CAN DO IT!

All four of our modern fasteners plants have the facilities to make specialty products to your drawings and specifications . . . to meet your special requirements: upset (hot or cold), forged, formed, machined, punched, threaded, coated or uncoated.

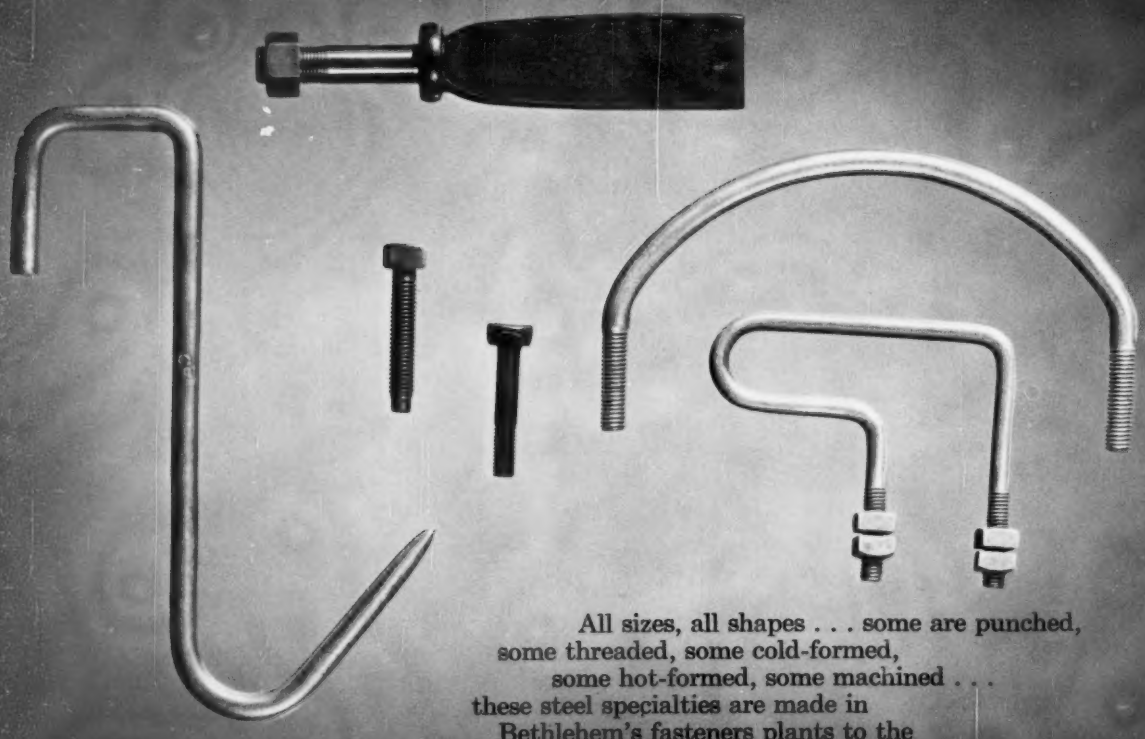
redesigned these cost-saving "specials"

Would you like a Bethlehem fasteners engineer to help solve your problems? He's at your service. Just send us a sample of the part you are now using, or a drawing or pencil sketch of what you have in mind. A complete description of the end use will help us to give you the best possible results.

BETHLEHEM STEEL

BETHLEHEM STEEL

look at this wide range of steel specialties



All sizes, all shapes . . . some are punched, some threaded, some cold-formed, some hot-formed, some machined . . . these steel specialties are made in Bethlehem's fasteners plants to the most exacting customer specifications.

Here's a partial list of steels and specialty products in the Bethlehem line:

BARS AND BILLETS:
Carbon and alloy AISI grades
Concrete reinforcing bars
Leaded steels
Special rolled sections

TOOL STEELS:
Water, oil, and air-hardening grades

FORGINGS:
Drop, press, hammer, and upsetter
Rolled-and-forged sections

ROD AND WIRE:
Hot-rolled rods, wire, and wire products

SHEETS:
Hot- and cold-rolled
Continuously galvanized
Enameling sheets

TIN MILL PRODUCTS:
Electrolytic and hot-dip tinplate; blackplate

PLATES:
Universal and sheared
Flanged and dished heads

WIRE ROPE AND SLINGS

FASTENERS:
Bolts, cap screws, rivets
Special fasteners

STEEL PIPE:
Continuous butt-weld
Electric resistance-weld

STRUCTURAL SHAPES

COLD-FORMED SHAPES

WELDMENTS:
Frames, tanks, housings, vessels

FREIGHT CARS, PARTS, WHEELS, AXLES

RAILS:
Tee, crane, girder

CASTINGS:
Carbon, alloy, stainless steel
Iron, brass, bronze

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BETHLEHEM STEEL COMPANY
Bethlehem, Pa.

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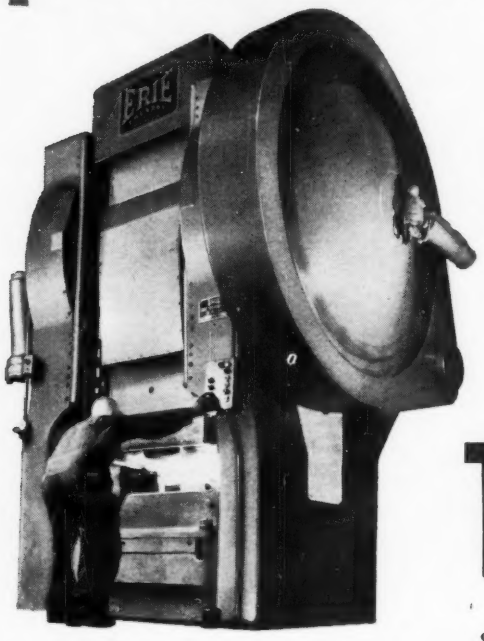
BETHLEHEM STEEL

BETHLEHEM STEEL

WANT TO AUTOMATE YOUR FORGING OPERATION?

You set your production goal . . .



ERIE WILL BUILD THE PRESS

Set your sights on higher output . . . Erie Foundry makes it possible to achieve it, with a high-volume automated forging press. As the first company to automate forging, Erie specializes in custom-designing and building automated presses in capacities up to 8,000 tons.

A single Erie-built automated press, with only one operator-observer, can actually triple your present production rate equalling the output of three regular forging presses and nine production men!

Trimming, too, can be accomplished in a single production cycle. With billet supply and finished part removal conveyorized you can achieve a production volume of, say, 1200 track-link forgings per hour.

To meet your specific needs, Erie Foundry will design a machine for high volume production of such parts as connecting rods, gear blanks, automotive and tractor valves, pinions, track links and wheel hubs.

For the complete story, phone or write Mr. R. E. Sanford, Erie Foundry Company, Erie 1, Pa.

ERIE

ERIE FOUNDRY COMPANY SINCE 1895

ONE OF THE GREAT NAMES IN FORGING

EF-60-US

Manufacturers of Forging Hammers • Forging Presses • Hydraulic Presses • Trimming Presses

J-8082

VIEWS OF EDITOR
THE EDITOR VIEW
VIEWS OF EDITOR
THE EDITOR VIEW

Callitroga hominivorax... an impressive name for a vicious killer. Three times as large as a housefly, it no longer costs millions of dollars in the Southeast, thanks to atomic radiation and the unique properties of Nickel Stainless Steel.

Atoms clobber a $20-million-a-year pest

How Nickel Stainless Steel helped fight costly cattle menace

A few small flies can kill a full-grown steer in ten days.

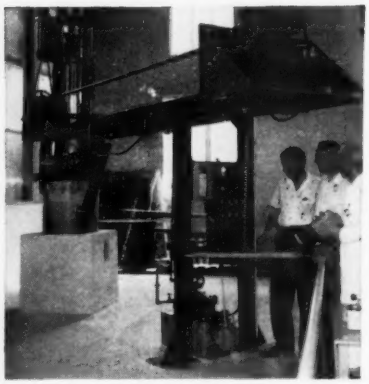
They call this killer *Callitroga hominivorax*, or screwworm fly. It used to cost Southeast cattlemen 20 million dollars a year.

Thanks to a peaceful use of atomic energy, the U.S. Department of Agriculture reports that *Callitroga hominivorax* was completely eradicated within seventeen months. This achievement may mark a new precedent in modern methods of pest elimination. Over two billion laboratory-raised male flies were sterilized by atomic radiation and then released. Because the females then laid sterile eggs, the screwworm fly population was destroyed.

Sterilization was accomplished by exposing males to gamma radiation from Cobalt 60 within a lead-shielded cask of Nickel Stainless Steel.

Nickel Stainless Steel was chosen by the designers, Knapp Mills Inc., for several reasons. It gives strength and rigidity to the cask's interior for greater handling safety. It stands up to the nitric acid solution used for radioactive decontamination — a cleaning process that plays havoc with less corrosion-resisting metals. And its sanitary, attractive appearance adds sales appeal to any product.

Are you in the atomic energy field ... or any field where you need a metal with a combination of superior properties? Consider the advantages of Nickel or one of its alloys when planning the construction of your equipment. Help with any metals problem is available from Inco. Just call or write us.



The Irradiator, nemesis of screwworm flies, is fabricated of Nicrolum*—a Nickel Stainless Steel to which lead has been metallurgically bonded. Six of these machines brought the fly menace under control.

*T.M. of the designer-manufacturer, Knapp Mills, Inc., Long Island City, N. Y.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

DEPRECIATION REFORM—

Labor's Myopia

The most encouraging industrial news to come out of Washington in a long time is the pledge by the administration for prompt action on the modernization of our outmoded depreciation policy. Few objective economists doubt that this will provide a powerful stimulus to our lagging economy.

The most disappointing development is the militant opposition voiced by labor leaders to any type of depreciation reform.

While the President iterated his good intentions after the labor leaders loosed their attacks on depreciation liberalization, it is conceivable that labor pressure on Congress could delay or modify the reform legislation.

It's hard to figure how organized labor can take such a stand at a time when unemployment is substantial—and rising—and the unions are suffering heavy losses in dues paying members.

We suggest they study what happened in West Germany, Japan, United Kingdom, Sweden, Italy, and France after those countries modernized their depreciation allowances. They have discovered that accelerating depreciation is a potent stimulus to productive investment, to high employment, and economic progress.

In fact, it has worked so well some of those countries have instituted temporary reversals to brake their economies when they were threatened with too much boom. Such was the case with West Germany in 1960. Sweden and Great Britain did it earlier.

Perhaps the labor leaders attacking Mr. Kennedy's proposals should read a study recently completed by Fordham University. It warns that we will face a serious unemployment problem if we continue the present depreciation policy.

U. S. industry today needs $96 billion worth of new equipment to replace obsolete equipment. During the next decade, it will need $60 billion more, just to keep up to date, say the Fordham economists.

"These figures do not take into account the amount of capital that will be needed for expansion to provide the tools for an additional 13.5 million workers in the next ten years."

We fear Messrs. Reuther, McDonald, and Meany are suffering from economic myopia.

Walter J. Campbell

EDITOR

From raw steel to finished product . . .

McKay Packaged Production Lines help Tex-Tube, Inc. lead the way in the Southwest

The McKay Machine concept of developing completely integrated, packaged production lines is paying dividends for Tex-Tube, Inc., a fast-expanding manufacturer of structural and petroleum tubing of Houston.

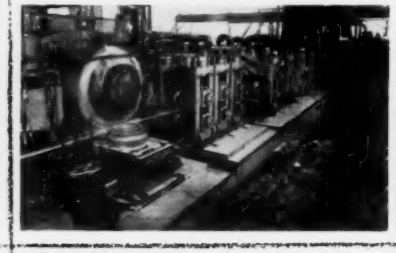
For Tex-Tube, McKay engineered a production unit that will form a complete line of tubing in a wide range of sizes from large multiple width coils.

The McKay production unit consists of a slitting line and two tube mills integrated with a shear welder. Tex-Tube is able to limit inventory only to gauge and type of steel . . . to slit to width desired, form, weld and cut-to-length tubing at a combined rate of 300 fpm in a smooth, continuous operation. They can, on this compact line, form tubing in size ranges from 1″ to 6⅝″ and any wall thickness up to 3/16″.

The result: Users of line pipe, oilwell casing and tubing, shothole casing, mechanical and structural tubing are assured quick delivery of highest quality tubing at fair prices.

Whatever you make—if it requires metal handling, feeding, slitting, shearing, stamping, welding or forming—you should know about McKay Packaged Production Lines . . . production equipment engineered to work in unison, with one-source responsibility from start to finish. Write for literature to *The McKay Machine Company, Youngstown 1, Ohio.*

SHEARWELDER—designed and built by Metal Processing Machine Co., subsidiary of McKay—trims tail of one coil and leading edge of second coil, welds them together in perfectly smooth weld while tube mill is running.



TUBE PRODUCTION—Series 700 McKay Mill, one of the two at Tex-Tube—gives Tex-Tube fastest production of top quality welded tubing in the widest variety of sizes.

CUTOFF—an integral part of the tube mill, it is a combination saw and rotary head type—cuts to exacting length, feeds onto automatic sizing and inspection table.

LOOK TO

McKAY MACHINE

FOR PROGRESS IN METAL PROCESSING

Charles A. Carter (left), chairman and president, and I. Walker Shaw, vice president, of Tex-Tube, listen as C. W. Thomas, McKay sales manager, points out that even though mill speeds have been increased substantially, the McKay process develops highest possible weld quality.

PHOTO BY ARNOLD NEWMAN

OHIO *WELDED TUBING*

CORNERSTONE-LAYING WITH

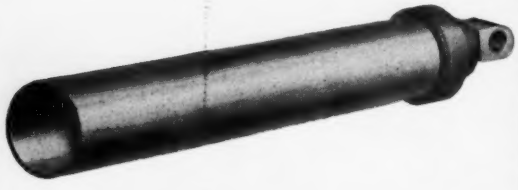
NO CEREMONY

In today's hustling, bustling construction business there's no time to stand on ceremony . . . no point in risking costly equipment failure.

To short-circuit mechanical downtime, leading construction equipment producers specify Ohio Tubing for power cylinders and fluid lines, mechanical and structural members. This gives equipment the heft and brawn to shrug off brutal, grinding punishment . . . gives equipment users a high degree of protection against disastrous delays.

You can strengthen your product — and its mechanical reputation — by specifying Ohio *Custom Made* Tubing. The name Ohio is the hallmark of the highest quality in tubing, both seamless and welded. And we're now able to deliver a broader range of welded tubing sizes, wall thicknesses and grades than ever before.

Let's not stand on ceremony. We want your tubing business — seamless to 7″ OD, *welded up to 7½″ OD.* For a fast start, contact your nearest Ohio representative, or send part drawings to the plant at *Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry In America.*



Ohio Seamless offers the broadest parallel range of both welded and seamless quality steel tubing in the industry.

OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • **SHELBY, OHIO**

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

Representatives in principal cities. Check leading directories: THOMAS', MacRAE'S, CONOVER-MAST, SWEET'S, FRASER'S.

A-3305A

Despite some labor opposition, President Kennedy and Treasury Secretary Douglas Dillon push . . .

Drive for Depreciation Reform

PRESIDENT Kennedy has renewed his pledge for tax incentives to spur capital spending.

Speaking before the National Industrial Conference Board last week, he said a program would be presented to Congress by the end of February. Significance: The latest promise came after powerful labor leaders rapped depreciation reform.

• **USW Opposed**—In its newspaper, *Steel Labor*, the United Steelworkers, headed by David J. McDonald, blasted depreciation reform. Research Director Otis Brubaker said that such reform of our tax laws is not a way to foster economic growth but "a modern version of trickle-down economics and an ill disguised way of cutting corporation taxes." He charged that such action would help bigger firms the most.

He also sees no need to expand or buy new equipment. Instead, he thinks the administration must find ways to utilize current excess capacity. He claims that "in the coming years" depreciation allowances and retained profits will be "more than adequate" to finance "the bulk" of the country's needs for new plant and equipment.

• **Reuther, Meany Too** — Walter Reuther, president of the United Auto Workers, joins the chorus: "Incentives for investment are unnecessary and unwise."

Last fall, AFL-CIO President George Meany signed a tax study which dammed even the reforms of 1954 and 1958 as unwarranted.

• **Administration Rebuttal**—Treasury Secretary Douglas Dillon replied to the union leaders: A tax incentive program's primary purpose is not to create more industrial capacity. Two factors justify use of incentives: The need to maintain stable prices at home and the need to solve our international balance of payments problem by bringing U. S. industry up to foreign standards. "There is no reason," he said, "why U. S. plants shouldn't be the most modern and the best equipped."

The President added (at the Conference Board meeting): "The average age of equipment in American factories today is about nine years. In a dynamic economy, that average should be falling as new equipment is put into place. Instead, the available evidence suggests that it has been slowly rising."

• **What Reform?**—President Kennedy has not spelled out what he will ask for. He may seek changes in two steps—one part immediately, the other part in April. The first step may be a request that business be granted a special deduction from its income tax bill if its investment in new plant and equipment is more than its depreciation deduction during the year (STEEL, Feb. 6, p. 37).

By April, proposals for more permanent depreciation reform may come. One of the most interesting is S. 580, introduced by Sen. George Smathers, a close friend of the President. It would allow a taxpayer to

select any period of depreciation, so long as it is not less than five years on new equipment purchased after Dec. 31, 1960. The minimum period is three years on used equipment. Real estate is excluded.

• **Reform Chances Still Bright**—Washington tax experts admit that labor's opposition to depreciation change does the cause no good. But they also believe that the administration's continuing strong position makes the outlook for reform "still the best in several years."

New Bill Aimed at Foreign Tax Havens

IN ADDITION TO tax incentives to spur plant and equipment investment via depreciation reform, several other tax measures affecting metalworking are getting attention.

The Eisenhower administration's request that income on the disposition of depreciable property be treated as ordinary income still finds favor in Treasury Department circles. It may end up in the total tax package.

Also, Sen. Albert Gore (D., Tenn.) has introduced a bill aimed at the so-called "foreign tax havens." The bill (S. 749) seeks taxation at 52 per cent (in the year earned) on profits of foreign subsidiaries of U.S. firms. Presently, profits of only the branches of domestic firms are subject to taxation in the year earned.

Subsidiaries are not taxed directly because they are foreign corporations, but Senator Gore gets around that. He wants domestic firms owning as much as 10 per cent of a foreign corporation to be taxed on their proportionate share of the net profits of the foreign firm.

The bill also calls for the repeal of foreign tax credits. Taxes paid to foreign countries would be treated only as deductions from the domestic firm's gross—just as taxes paid to states in this country are handled.

Here's 25 Year Look Ahead At the Heating Industry

"ACCOMPLISHMENTS in the heating industry in the next 25 years could well be a thousand times greater than those of the past 25 years."

That's the prediction of H. F. Holtz, vice president of Cleaver-Brooks Co., Milwaukee heating equipment manufacturer. Major changes will hinge on peacetime utilization of atomic energy. Assuming that the heating industry will have a relatively free hand, Mr. Holtz makes these predictions for the year 1986:

• **Heating Systems**—High temperature, hot water heat transfer will be used in all major commercial and industrial markets. It will also have some acceptance in the home.

Solar heating for domestic use will be becoming competitive with wet heat. Capacitors will store solar energy for use on a cloudy day.

Electric heat will be used primarily in new home construction. Reason: Only a limited amount of atomic energy or electrical power transmission will be available.

Forced air heating will be a replacement market business only, comparable to what the stoker industry is today. And the heat pump won't quite make the grade because of the availability of other energy sources.

Steam for low pressure heating systems will also be faced with a declining market. It's possible that it will be used primarily in the replacement boiler market. High temperature hot water boilers will be commonplace for year-round use —cooling in the summer and heating in the winter.

• **Heating Fuels**—Gas will have passed its peak use for heating and be in a gentle decline. (A crest 65 to 75 per cent of the total heating market is likely.)

Fuel oil will account for less than 10 per cent of our total heat producing fuel. Coal, which is used today in central station or power station work, probably won't be major heat source in that field.

The balance of the market will include such things as solar systems and heat pumps. Such techniques will account for 5 to 10 per cent of the total.

• **Fuel Burners**—Oil and gas burners will be completely redeveloped. They'll be using a turbine type design featuring few moving parts, low maintenance costs, and many of the advantages of today's jet engines, predicts Mr. Holtz. The atomizing of heavy fuels will have been solved via the use of high frequency sound waves.

In boiler and pressure vessels, noncorrosive metals (even plastics) will have almost eliminated oxygen or scale corrosion problems.

Steel and cast iron pipes will be competing strongly with new plastics and styrene byproducts. There will be a new series of metals for lighter, stronger, noncorrosive use in burners, controls, and accessories.

Electronic controls will include a built-in energy source to compensate for requirements in the event of power failure or power fluctuation.

Energy requirements will be computed on a national and area level, making it possible for cooler sections of the country to be supplied with energy from areas experiencing warming trends.

"Today, we talk in terms of 80 per cent efficiency in boiler equipment. With more effective means of burning fuels and with higher heat transfer rates possible with new design, efficiencies in excess of 90 per cent will readily be obtainable 25 years from now," Mr. Holtz believes.

The Milwaukee executive challenged the oil industry: There will be an entirely new concept relating to heat transfer and the liquids and gases required. This one point alone could well be the salvation of the oil industry. It is in a position to develop higher transfer fluids which will be far more efficient than present day water or heat transfer oils.

35,000 volts trigger underwater explosions . . . to form parts like these

Electrospark Shapes Tough Metals

PIECES UP TO 10 in. in diameter and 3/32 in. thick are being formed by underwater electrical explosions in the General Engineering Laboratory of General Electric Co., Schenectady, N. Y.

GE says that the forming of missile sections 10 ft or more in diameter and at least 1 in. thick is deemed feasible.

A development similar to that reported in STEEL (July 11, 1960, p. 92), the GE method is described as "capacitor discharge electrospark forming." Controlled explosions create shock waves of such force that intricate contours can be formed in millionths of a second.

No chemical explosives are used in the process.

• **What It's for**—The process is aimed at low cost shaping of hard to form metals. Titanium, columbium, beryllium-copper, and the more difficult grades of stainless steel have been shaped in the laboratory. It is believed that tungsten and molybdenum can also be handled by the process.

The process is expected to have particular significance in the manufacture of aircraft and missile parts requiring exotic metals. They are difficult to form by conventional methods.

GE says electrospark forming could save millions of dollars yearly in that area.

• **How It Works**—The underwater explosions are induced through a buildup of electrical energy—about 35,000 volts now; available energy is expected to reach 100,000 volts or more eventually. The electrical energy (stored in capacitors) is triggered to create a spark across two electrodes. Theorists say the spark heats the water to produce a gas which expands rapidly. Almost all the energy produced is transmitted through the resulting shock wave.

No preheating is required to make the metals ductile. The shock waves are directed against the metal. Upon impact, the blank instantly takes on the shape and surface texture of the die. The die is evacuated to remove air pockets that might cause the piece to have surface irregularities. Minimum finish machining is required.

GE says the process promises substantial savings through the elimination of storage and handling problems associated with chemical explosives. The firm also emphasizes that facilities need not be located in a remote area.

Status of Our Saline Water Conversion Projects

LOCATION	DAILY CAPACITY (GALLONS)	COST	COMPLETION DATE (1961)
PILOT PLANT			
St. Petersburg, Fla.	35,000	$500,000	March
DEMONSTRATION PLANTS			
Freeport, Tex.	1 million	$1,206,250	March
Webster, S. Dak.	250,000	$482,200	August or September
San Diego, Calif.	1 million	$1,608,000	November
Roswell, N. Mex.	1 million	–	–
Wrightsville Beach, N. C.	300,000	–	–

Source: Department of Interior.

Economical Conversion of Salt Water

ECONOMICAL CONVERSION of salt water to fresh water for industrial and consumer use is getting closer to realization. The Office of Saline Water, Department of the Interior, will start up a pilot experimental conversion plant within two to three weeks at St. Petersburg, Fla. Three demonstration units (see table above) will also get underway this year. Two other projects are in the planning stage.

Although $10 million was authorized for research and development from fiscal 1953 to fiscal 1963, another $10 million was allocated in 1958 for use (through 1965) in the demonstration plants. Of that sum, $1,850,000 was spent in fiscal 1960 and $2,040,000 will be spent in fiscal 1961.

• **Why It's Important**—The work is significant from two angles.

We'll need the water. It has been estimated that the nation's fresh water needs could exceed supply by 80 billion gallons a day within 20 years if nothing is done. Consumption has increased nearly eightfold since 1900. Americans now consume 312 billion gallons of water daily. The Department of Commerce estimates we'll be using 453 billion gallons a day by 1975—just about all our present facilities provide.

Industry uses vast amounts of water. For example: As much as 65,000 gallons of water are required to produce a ton of steel. A 1000-ton-a-day blast furnace uses 11 million gallons of water in 24 hours. And a continuous hot strip rolling mill uses up to 21,000 gallons of water a minute. Industry recirculates—re-uses—much of its water.

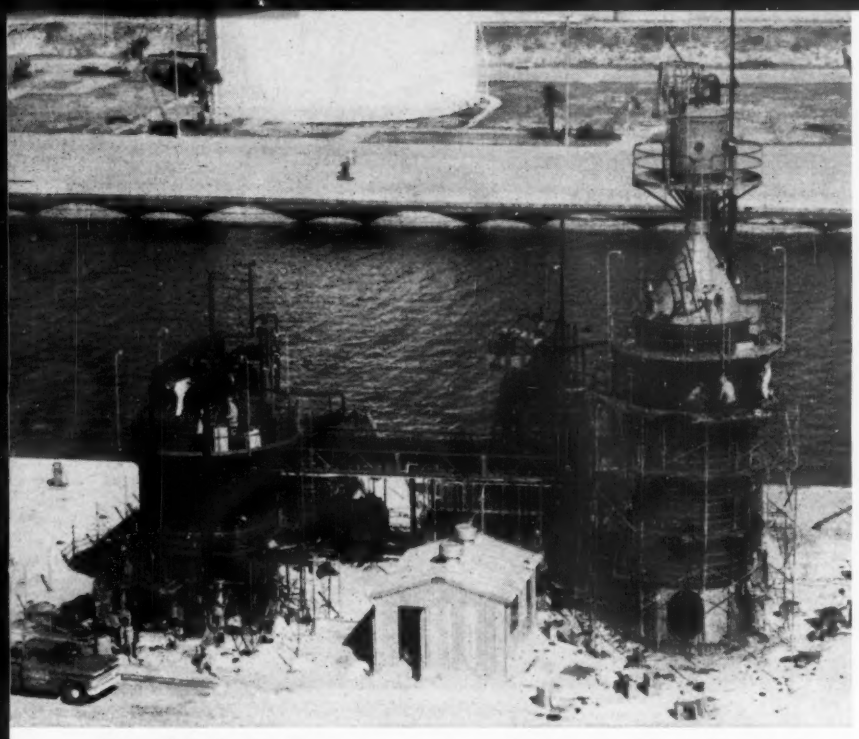
Not only will metalworkers benefit from the potential new water sources, but the door may be opened for a big equipment market for the conversion installations.

The target conversion cost of each method used at demonstration plants is $1 per 1000 gallons. However, estimates ranging as low as 38 cents per 1000 gallons have been made, depending upon the method used and size of the operation.

• **Processes**—Several processes are being studied:

• Long tube vertical evaporation: Salt water is brought to the top of an evaporator and falls through a series of tubes (called tube bundles). Steam around the tubes causes the water to boil, yielding a mixture of hot brine and vapor. The vapor is drawn to supply heat in a second evaporator. The hot brine is pumped to the top of the second evaporator where it again falls through another tube bundle. As the vapor gives up latent heat of vaporization, it is condensed into fresh water. The process is repeated through 12 evaporators.

• Multistage flash: Saline water is pumped into a vacuum chamber where the boiling point is reduced to 180° F by lowering the pressure. Brought in at temperatures above the boiling point, the water flashes into steam. This is repeated in a series of 36 chambers at even greater



This pilot plant will convert sea water into fresh water, using the freeze evaporation method. It will be put into operation next month at St. Petersburg, Fla.

Nears Reality

reduced pressures consequently lowering the boiling point.

• Forced circulation vapor compression: Water is pumped through a tube bundle where part of it boils as it goes through. A mixture of hot brine and vapor emerges at the top of the tubes. The vapor is drawn off and compressed, thus raising its temperature. It is then pumped into the heat side of the tubes to act as the heat source. When the vapor gives up its heat to boil more water in the tubes, it is condensed into fresh water.

• **Electrodialysis:** The electromotive fields of force attract dissolved salts, permitting only fresh water to pass through thin membranes.

• Freeze evaporation: On the theory that an ice crystal is pure water, the saline solution is partly frozen into a slush. Thus the pure water in crystal form is separated from the brine, washed free of salt, then melted into fresh water.

A method of solar distillation is also being studied, and General Electric Co. (see story at right) has just announced another new process.

Any or all the processes being tested may finally be accepted for commercial application, says the Office of Saline Water. Different situations and operation size will influence the decision. For example, the Roswell, N. Mex., and Webster, S. Dak., demonstration plants will work with inland water which has a salt level considered unhealthy. The level may even be greater than that of sea water. Such brackish water contains more than 1000 parts of salt per million parts of water.

• **Freeze Research**—The St. Petersburg pilot plant, which has attracted attention from water authorities around the world, will be testing a freezing system developed by Dr. H. F. Wiegandt, Cornell University, Ithaca, N. Y., and Blaw-Knox Co., Pittsburgh. Cooper-Bessemer Corp., Mt. Vernon, Ohio, and Florida Power Corp. are also involved in the pilot plant project.

Carrier Corp., Syracuse, N. Y., is testing a freezing process at a test plant now operating at Wrightsville Beach, N. C. Capacity: 15,000 gallons daily. Still another freezing method is being worked on by Struthers Wells Corp., Sharon, Pa., and Scientific Design Co. Inc., New York. One reason for the interest in freeze evaporation is that the freezing system to be used in the Wrightsville Beach, N. C., demonstration plant hasn't been picked.

Several small commercial conversion plants are already operating in this country. Total world conversion capacity is 20 million gallons a day.

New Distillation Process To Convert Salt Water to Fresh Water Tested by GE

GENERAL ELECTRIC CO. says its new system for extracting high volumes of pure water from the sea is "thoroughly feasible."

The evaporator in the GE process consists of two vertical tubes, one inside the other. Sea water is fed into a wiper assembly where slowly revolving blades spread the salt water on the inner surface of the inside tube in a film 1 thousandth in. thick.

Heat, produced by steam, is transferred through the walls of the inside tube, causing the salt water to evaporate. Pure water leaves the evaporating chamber and the concentrated brine is drained off.

• **Advantages**—GE claims the clean tube heat transfer rate is four times higher than that of any other distillation unit now in commercial use. Boiling of salt water, which could diminish purity, has been eliminated because the films of water spread by the revolving wipers are so thin they will not support bubble formation. The firm believes the system may offer a 60 per cent saving in space requirements and 40 per cent reduction in weight over conventional systems for marine uses. The process is applicable to salt, brackish, or polluted water.

The developmental work was done under government contracts with the Office of Saline Water, Department of the Interior, and the Bureau of Ships, Department of the Navy.

Machine tool builder J. J. Jaeger sizes up the problems of inadequate equipment replacement, cites some steps that could help. As he sees it . . .

'Obsolescence Has Created a Crisis'

MANAGEMENT must abandon its negative attitude toward capital investment.
LABOR must take on responsibility beyond the mere winning of periodic pay raises.
GOVERNMENT must get rid of depreciation policies that are more obsolete than the equipment they are supposed to help replace.

Those three steps are essential, says J. J. Jaeger, if the U. S. is to recover from its "tool crisis" and become a strong competitor in a revitalized world market.

Mr. Jaeger, president, Pratt & Whitney Co. Inc., West Hartford, Conn., points out it's easy to blame labor, high taxes, low depreciation rates, inflation, and other factors for the decline in our competitive manufacturing systems. "But American industry cannot avoid its share of the responsibility—failure to modernize its productive machinery."

● **"Profit is a good scale to gage management effectiveness, but it's got to be a long range measurement."**

Mr. Jaeger feels that company managers, directors, and stockholders often put too much emphasis on short run profits. "They seem to feel that profits must be high this month, this year, then next year, and every year."

The danger, he warns, is that the emphasis may rob a company of future profits by discouraging investment today in better market penetration, in more new products, and in more efficient capital facilities. "All of those things have a direct bearing on tomorrow's profits, and they, too, should be used to measure management effectiveness.

"Too many managers cock an inquisitive eye at the balance sheet and decide they can get by a little bit longer with their old equipment. Others do not take full advantage of depreciation allowances available, such as the sum-of-the-digits or the double-declining-balance methods. Others choose a payoff period so short that it becomes impossible to ever justify a replacement.

"Such thinking merely postpones the day of reckoning. Each month industry tolerates an outdated, inefficient machine, it is limiting a profit potential which it should accumulate over a period of years. Manufacturers, in short, pay for modern machinery, whether they install it or not."

Mr. Jaeger says no set of rules for capital spending will fit all companies. For his own company, he figures on spending about 25 per cent more each year than his depreciation allowances for new capital equipment—he admits it's nearly impossible to do that today when (like most machine tool builders) he's operating at or near the break-even point.

Most of the P&W capital spending is going according to a master plan. "We have set ourselves a goal. We know what share of an estimated total market we intend to capture. We have set up a paper description of our plant as it should be to manufacture that share and do it efficiently."

As part of the plan, P&W is consolidating its operations. Mr. Jaeger feels his company still reflects departmental procedures established during the war and immediately thereafter. Some of the resulting

capacity is not needed for normal operations. More than 400 pieces of equipment have been disposed of. Also, the plant is being rearranged for optimum efficiency.

A project now underway: All 30 of P&W's jig borers are being replaced with numerically controlled machines. ("Our practice is to take out two machines for every one we install.") The first numerically controlled machines in that department were installed in 1957—to date, not one piece of scrap has been caused by faulty tape control positioning.

In justifying new equipment, Mr. Jaeger uses a payoff period of two to seven years, depending on the estimated production life of the parts to be made and on the degree to which the machine is a standard, multipurpose type.

Mr. Jaeger is not satisfied that his program for capital spending is aggressive enough, but he feels the programs, even at the present pace, will give his company an advantage over any company that works too close to a balance sheet philosophy. Capital spending, and capital planning, he repeats, will get him tomorrow's profits.

• Government must help the industrialist modernize.

Encouraged by recent evidence of government interest in depreciation revision, Mr. Jaeger says: "Our current writeoffs are unfair and unrealistic, and, in the light of what other nations have done, they are dangerous."

"In Europe, many tools are being written off in five years. England and Denmark allow first year writeoffs as high as 30 per cent. In American industry, writeoffs often run 15 to 25 years.

"Government must also keep the productive efforts of the defense segment at maximum efficiency and quality. If through short range objectives some of our industries are destroyed, we'll have no place but abroad to go for knowledge and machines to make our weapons."

• "Organized labor must also take an enlightened view."

He emphasizes that: "Labor wins no victory if our profits are shrunk to the point where we can't operate efficiently. High wages squeezed from low production merely price U. S. goods out of the U. S. and world markets and U. S. workers out of jobs. Wage boosts not justified by increased productivity create inflation that hurts everyone."

• "Stockholders must adjust their economic goals."

"Dividends are justified only when they are created by efficient production. In many cases, that means that today's dividends are too high. They should not be paid by deferring maintenance or postponing modernization—that's paying dividends out of capital."

He feels stockholders must realize that to compete successfully and to expand, a company must keep facilities up to date. Otherwise, no reward for anyone can be anticipated.

• "We must not degenerate into a nation of industrial has-beens."

Mr. Jaeger fears that if obsolescence is tolerated, we will become a nation of buyers, sellers, and servicers of the products of others—"A nation of brokers, middlemen, repairers, and tinkerers. And, inevitably, a third rate power."

CARAT-SIZED MANMADE DIAMOND is held by A. J. Nerad, manager of General Electric's diamond making research program. Compare it with the mound of small manmade diamonds commercially produced for industry. The larger diamond, dark in color, is not yet of sufficient strength for industrial applications

Says Defense Steel Output Impractical During Strike

Trying to maintain partial operations during a strike to provide steel for defense needs is neither practical nor feasible.

That's the conclusion of an analysis made by the Business & Defense Services Administration. BDSA assumed three situations in its study: 1. Activating facilities needed to produce for defense needs only. 2. Using the same facilities to produce commercial products as well. 3. Activating plants for full production—including the facilities needed to produce defense steel.

BDSA said partial operation is impossible: Often, a full range of products must be produced to get the end product desired. Checking the feasibility of keeping some segments of the steel industry in operation to meet defense needs during a strike was one of the suggestions made by E. Robert Livernash, Harvard professor, in his special report to the Labor Secretary.

Japan's Electronics Makers Up Sales in World Markets

The Japanese electronics industry is showing increasing aggressiveness in the world market—the U. S. is still its most important market, but exports to other countries are expanding more rapidly.

During the first nine months of 1960, electronic product exports to the U. S. increased 37 per cent vs. the like period of 1959 while exports to the rest of the world rose 81 per cent, reports the Electronics Division, Business & Defense Services Administration.

What Investigations Next? ... Programs to Aid Firms Hurt By Foreign Competition Get More Backing in Congress

Kefauver Plans Busy Session

Look for the Senate Antitrust & Monopoly Subcommittee to start soon on a series of investigations directly involving metalworking. Sen. Estes Kefauver (D., Tenn.), the chairman, has asked the Senate for $450,000 for this year's work.

With the Kennedy administration's emphasis upon the need to boost our exports, the senator will lead his group into a study of how "high prices and the inflexibility of prices" cause us to lose foreign markets. The study will be particularly directed to those "concentrated industries" which have "administered" prices.

The senator will also continue his watchfulness over the electrical industry. Reports are circulating in Washington that the Tennessee Valley Authority, for example, recently received identical bids on some work. The electrical industry's foreign business will also be checked.

To maintain his relation to the needs of the consumer, the senator is calling for a look at the hearing aid industry. On the industrial side, a look at the nickel industry is promised. The committee is certain to build even closer relations with the Federal Trade Commission now that Rand Dixon, former top Kefauver aid, has become chairman.

● **GOLDBERG TRADE ADJUSTMENT BOSS?**—While the Kennedy administration delays giving Congress its formula for trade adjustment (aiding domestic industries harmed by foreign competition), several interested legislators are advancing their pet programs. Sen. Kenneth Keating (R., N. Y.), for example, advocates (S. 675) giving the secretary of labor the job of answering appeals from harmed domestic companies. Secretary Arthur Goldberg would be empowered to call upon the President for relief under the escape clause (Section 7 of the Trade Agreements Act). Where the harm was caused by the "wage cost" differential, tariffs and quotas or a combination of the two could be used.

Some powerful conservatives have lined up behind the bill, but chances of passage appear slim. The concept might well be taken up by more liberal forces, however, and broadened to include loans or grants under the depressed area type of legislation already advocated by Sen. Paul Douglas (D., Ill.). The idea of making the labor secretary the decision maker could take hold in the White House, too, although it will be fought by the Commerce Department.

Commerce already has an office of area development in the Business & Defense Services Administration, which has just begun studies of five industries to see if new plants might be located in depressed areas. The industries are industrial electronics, fabricated plastics, scientific instruments, containers, and electrical machinery.

● **REPUBLICANS OFFER A PLAN**—Sen. Jacob Javits (R., N. Y.) and Sen. Clifford Case (R., N. Y.) are sponsoring "national export-import policy" bills. The measures would give the President the authority to "phase out" over a period of seven years tariff protection granted by the Tariff Commission, while offering "adjustment assistance" to businesses, workers, and communities hurt by the loss of protection. The assistance would cost from $100 million to $150 million a year, and be in the form of tax incentives, technical aids, unemployment compensation, retraining assistance, provisions for early retirement, and relocation allowances to workers. Senator Javits would also establish a $100 million revolving loan fund for businesses, communities, and industrial development corporations, and add $50 million to the small business administration's loan fund.

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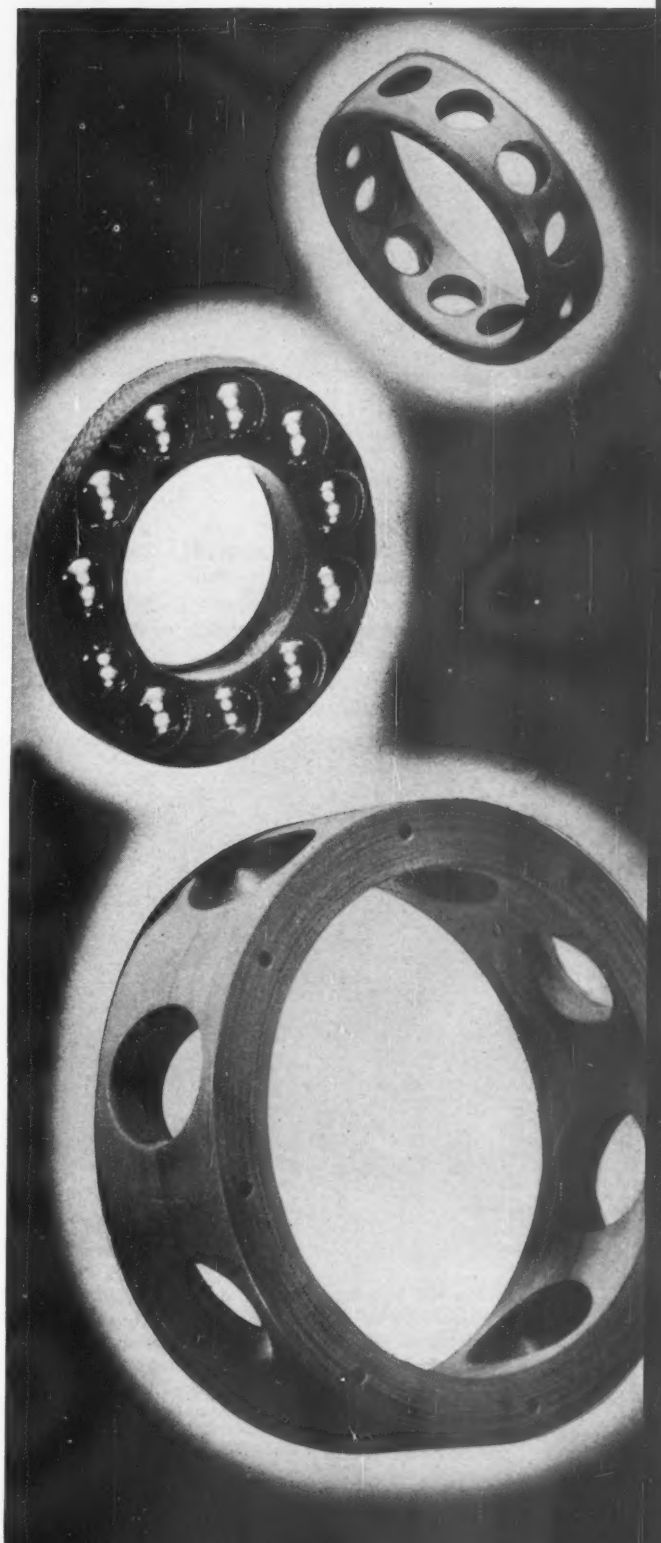
Plastic Laminates: Competitor, Ally

Ball bearing retainers made of fabric-base laminated plastics by Synthane Corp.



HIGH PRESSURE plastic laminates are racing exotic metals to the moon (as components in missiles), and they're finding steadily increasing uses in this world too (autos, for example).

Weber de Vore, director-advanced materials division and special projects group, Taylor Fibre Co., Norristown, Pa., lists the chief features of laminates:

- High strength to weight ratio: Laminates are considerably stronger than many metals, says Mr. de Vore. Their strength can be shifted directionally by changing the weave (if a cloth base is used) and by filament winding.
- Low heat transfer: They resist "extreme changes in temperatures," he says—making them ideal for protecting structural members in missiles.
- Comparative rigidity in cured condition: This property prevents the laminate from bulging or otherwise deforming when high pressure or other stresses are present. Original tolerances can be maintained under adverse operating conditions.
- Excellent corrosion resistance: They withstand atmospheric and chemical corrosion.
- Good ablation qualities: The outside of the material may begin to "use up" or wear out, but the inside remains relatively sound structurally because of the low thermal conductivity of the laminate.
- Ease of fabrication: Most laminates are as easy as wood or metal to machine, and standard machinery can be used. High cutting speeds and feeds are possible because of lower shear strength. A coolant to control heat is necessary due to poor thermal conductivity.

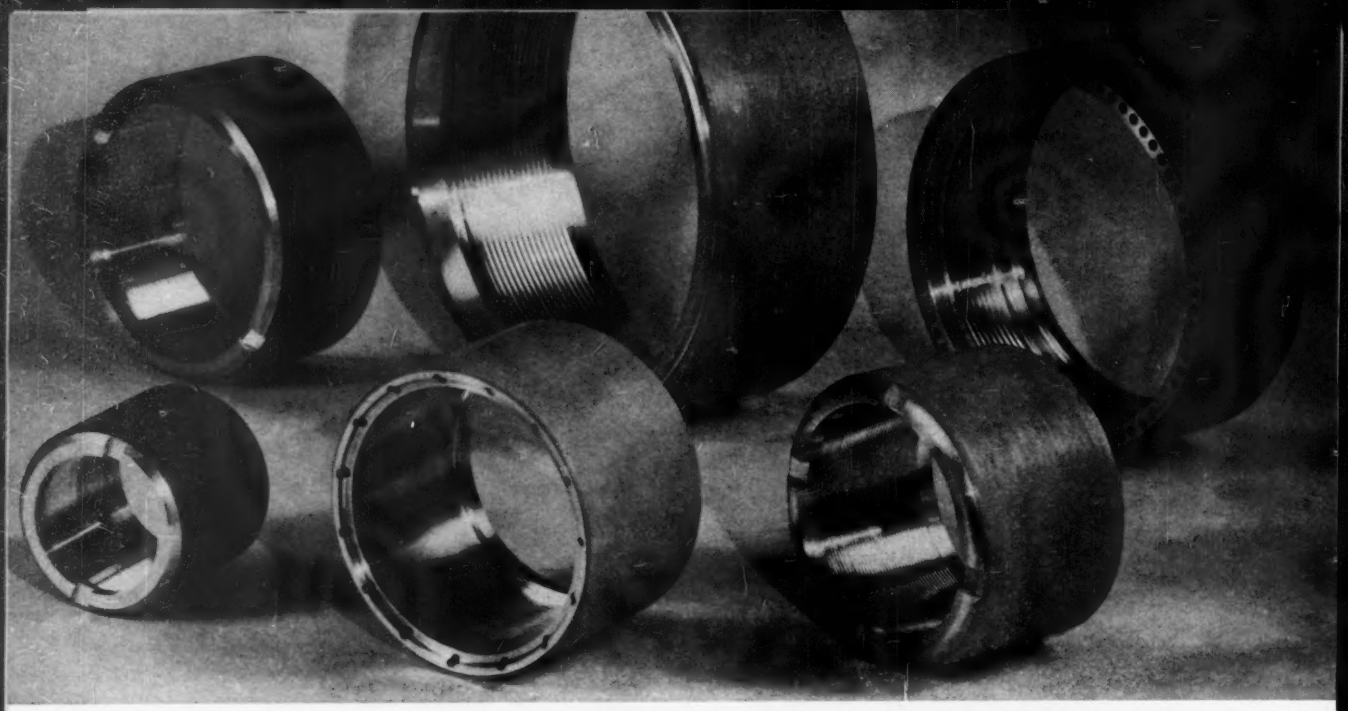
- **Latest Developments**—Flame retardant, high temperature laminates are finding increasing use in computers and electronic devices, says Herbert Widdop, manager-customer service and sales promotion, Synthane Corp., Oaks, Pa.

"Constant temperatures of 500° F are possible with these laminates," Mr. Widdop says, "and temperatures up to 5000° F may be endured for very brief periods."

Synthane laminates are available in sheets, rods and tubes. Producers of laminates use hundreds of combinations of fillers (the base material) and resins. The resulting products offer a wide range of mechanical, electrical, and chemical properties.

Continental-Diamond Fibre Corp., Newark, Del., a subsidiary of Budd Co., has developed a Dilecto laminate (called RD-105) for applications requiring the ablative protection needed for exit cones in rocket engines. Laboratory tests show that the burn-through rate is less than one-third that of phenolic reinforced, high silica glass, the company says.

- **Laminates Join Metals**—Recent advances in bonding techniques have made it possible to bond virtually any



Synthane Corp. bonds laminated plastic tubing to aluminum for use in such parts as aircraft piston landing gear units

compatible material with a laminate. They can be supplied as clad or as sandwiched materials and shaped to fit many design requirements. Laminates are generally combined with steel, aluminum, and copper.

Copper clad laminated plastic is probably the best known of the composites—it is used in etched printed circuits. Taylor Fibre lists other metal-laminate composites:

• **Lead**—Lead sheets bonded between paper base laminates have been used for x-ray shields. The laminate provides strength and contributes to the shielding properties of the lead.

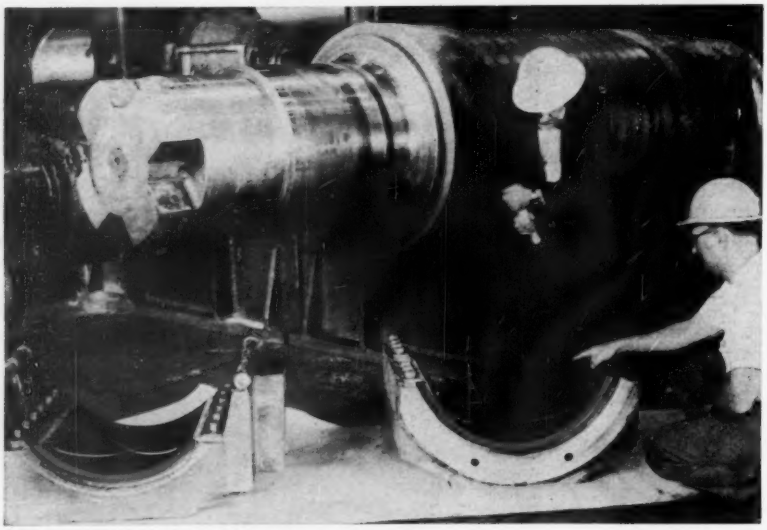
• **Aluminum**—This combination is used extensively for engraving stock and plate holders for x-ray machines (where aluminum acts as a shield). It probably could be used as printed circuit material, but soldering problems remain to be solved.

• **Beryllium Copper**—The metal is nonmagnetic and a good conductor. The combination has possibilities for printed circuit applications.

• **Stainless steel**—This combination has applications where nonmagnetic properties are required.

• **Magnesium**—This clad material is used as a screen for x-ray operators. The metal reduces the weight of large pieces.

• **Silver and gold**—Electrical contacts represent a possible applica-



These top roll bearing segments are used in a 45 in. universal slabbing mill at the Fairless Works, United States Steel Corp. Made of Westinghouse Electric Corp.'s Micarta, a bonded phenolic laminate, the bearings are replacements for other Micarta bearings that were in service for almost half a year. During that period, the mill rolled in excess of a million tons of steel. The bearing material combines a cushioning effect with a low coefficient of friction at low speeds, Westinghouse states

tion. Metal can be bonded to almost any grade of laminated plastic, but the metal usually must be treated to eliminate oxides. Other materials, such as rubber, can be bonded to laminates for gaskets. Combinations of laminates with cork or rubber seal the tops of electrolytic condensers more effectively than either material alone.

Retainers for precision ball bearings, made from a combination of plastic laminate with aluminum provide great accuracy and permit reduction of bearing size.

Aluminum tubes with phenolic fabric laminates are used in aircraft landing gear equipment and hydraulic pistons.

Other mechanical applications for laminates include gears, cams, pinions, bearings, piston rings, bolts, setscrews, valve discs, pipe flanges, instrument panels, switch parts, and rotor vanes.

Plastic laminates are replacing metals in many applications, but they can also be "used" to advantage by metalworkers:

- **Put idle machines to work fabricating laminates. Standard metalworking and woodworking machines can handle laminates.**
- **Metal clad laminates or composites offer new design possibilities, economies, and improved products.**
- **Plastic tooling and dies may bring savings and increase efficiency.**
- **Laminators are a market for equipment makers.**

• **Automotive Uses**—The automotive industry uses plastic laminates. Printed circuits are an example—they're used in Oldsmobiles. Some temporary and short run tooling fixtures are made of plastic laminates.

L. L. Linzell, technical assistant, Chrysler Corp. Stamping Div., Detroit, reports: "Our most extensive usage has been in the field of duplicate models and inspection fixtures."

• **Appliances**—Two of the nation's largest appliance makers—General Electric Co. and Westinghouse Corp.—operate plastics divisions.

Westinghouse uses its Micarta on the top of one of its portable dishwashers for a work surface. GE's laminates (Textolite) find use in furniture, doors on kitchen cabinets, and as interior trim of trucks. In addition, there are many industrial applications.

• **Food Industry**—Russell B. Galloway, general sales manager, Synthane Corp., says that laminates are replacing conventional bearings and bushings in food handling equipment because of their corrosion resistance. Another factor: The laminate components do not require lubrication. A synthetic lubricant is incorporated into them.

"At one time, 90 per cent of our products were sold for electrical insulation," Mr. Galloway says, "but today, 35 per cent are sold for electrical insulation, and the bulk go for mechanical applications. Many of the mechanical applications replace metal."

Continental-Diamond Fibre markets a "plastic armor—tough as steel." It's used as body armor, in armored cars, gears, and other machine parts that call for high impact strength.

• **Sales**—The 19 laminators reporting to the Laminated Products Section of the National Electrical Manufacturers Association valued their shipments in the first 11 months of 1960 at $72 million—vs. $77 million in the same period of 1959.

• **Market for Equipment**—Laminators, particularly the 50 per cent that do their own fabricating, provide a market for equipment makers. Mr. Galloway of Synthane says his company is constantly adding lathes, milling machines, drill presses, punch presses, process equipment, coating machines, tube winders, and sheet presses. He says improvements in machine speed and quality control are sought by fabricators.

The laminating press is the chief piece of equipment. It may range from a 4 by 8 ft, 3000 ton press with 10 to 12 openings to a 4 by 16 ft, 5000 ton press with 15 openings.

One firm (Erie Engine & Mfg. Co., Erie, Pa.) reports its sales of about $200,000 yearly the last two years. Although the company's business in this area is expected to be about the same this year, orders from Japan and India could boost it considerably, says Thomas Kramer Jr., sales manager. He adds: "We're now adding automation to our presses, covering the material handling aspects."

A 60 per cent increase in laminating press sales is expected this year by John C. Kosky, manager-industrial advertising, Industrial Equipment Div., Baldwin-Lima-Hamilton Corp., Philadelphia. The gain will come from a sale of "two large presses for major laminators."

• **Foreign Competition**—One pressmaker said an important order had been lost to a German company. "It's a serious problem and getting more so," says Ernest B. Brown, manager-Machinery Dept., R. D. Wood Co., Philadelphia. He says that the German maker produced its laminating press for 40 per cent less.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

Thermonuclear Power May Tap Unlimited Fuel Supply

THE SEARCH for economic thermonuclear power, though being conducted with a minimum of publicity, now involves millions of dollars and the talents of scores of scientists.

Unlike a nuclear reaction, where neutrons are used to split the atom, a thermonuclear reaction works on the principle of fusing two hydrogen atoms into one helium atom by intense heat.

• **Prospects**—Will a sustained thermonuclear reaction ever be economically feasible? "At this point no one can give a clear cut yes or no," replies Dr. Edward C. Creutz, vice president of research and development for General Atomic Div., General Dynamics Corp. "If we didn't feel the fusion process had economic potential, we wouldn't be working on it."

• **Where We Stand**—There's no timetable on when fusion would become an economic reality, says Dr. Creutz. "Right now, the whole program is still in very basic research."

Theory has not been completely worked out. Many necessary experiments have yet to be performed. "The energy is there," explains Dr. Creutz, "but we don't know yet how to get at it or even in which direction to go."

The problem is that energy has to be generated at a faster rate than it radiates away. The radiation rate rises sharply as temperatures are boosted, but the rate of power generation goes up even more rapidly. Consequently, immense temperatures are needed for a thermonuclear reaction—about 100 million degrees F. This is about ten times the temperature of the sun. How to create and contain this heat-energy is the challenge. Currently, magnetic fields look most promising, relates Dr. Creutz.

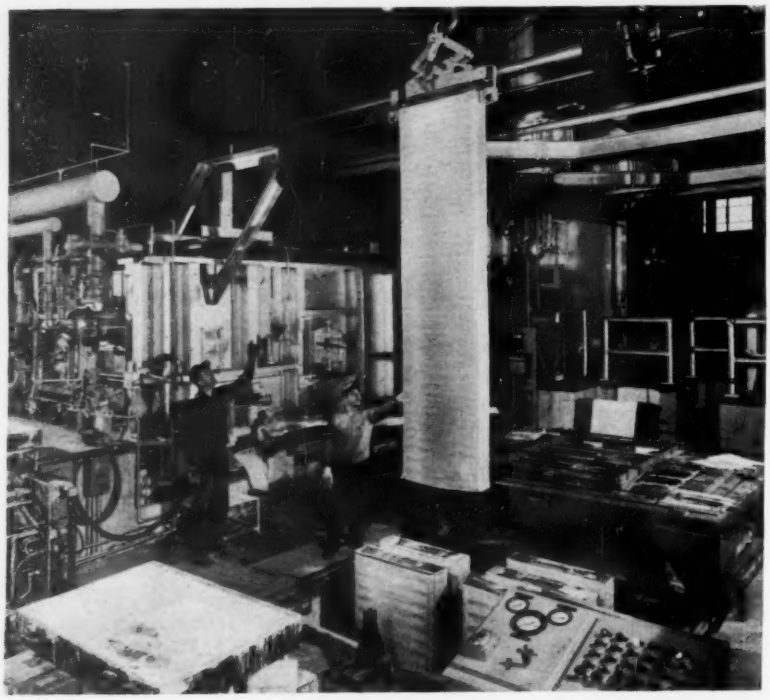
• **Why The Fuss?**—Mainly because there's an inexhaustable fuel supply. The fuel would be the hydrogen isotope deuterium, which is found in any type of water in the ratio of 1 part to 10,000.

Here's the potential: One gallon of water could provide as much energy as 300 gallons of gasoline! Another slant: There's enough potential energy in seawater alone to provide the earth's needs for one billion years!

• **Costs**—Fusion would sharply reduce energy costs. At least one third of the energy could be directly converted to electricity without going through the steam cycle. The remaining energy would be converted by conventional methods.

Unknown are the cost and types of capital equipment and materials which would be needed. It's considered safe to predict that large copper coils, traditional power generating equipment, and some type of shielding device would be needed.

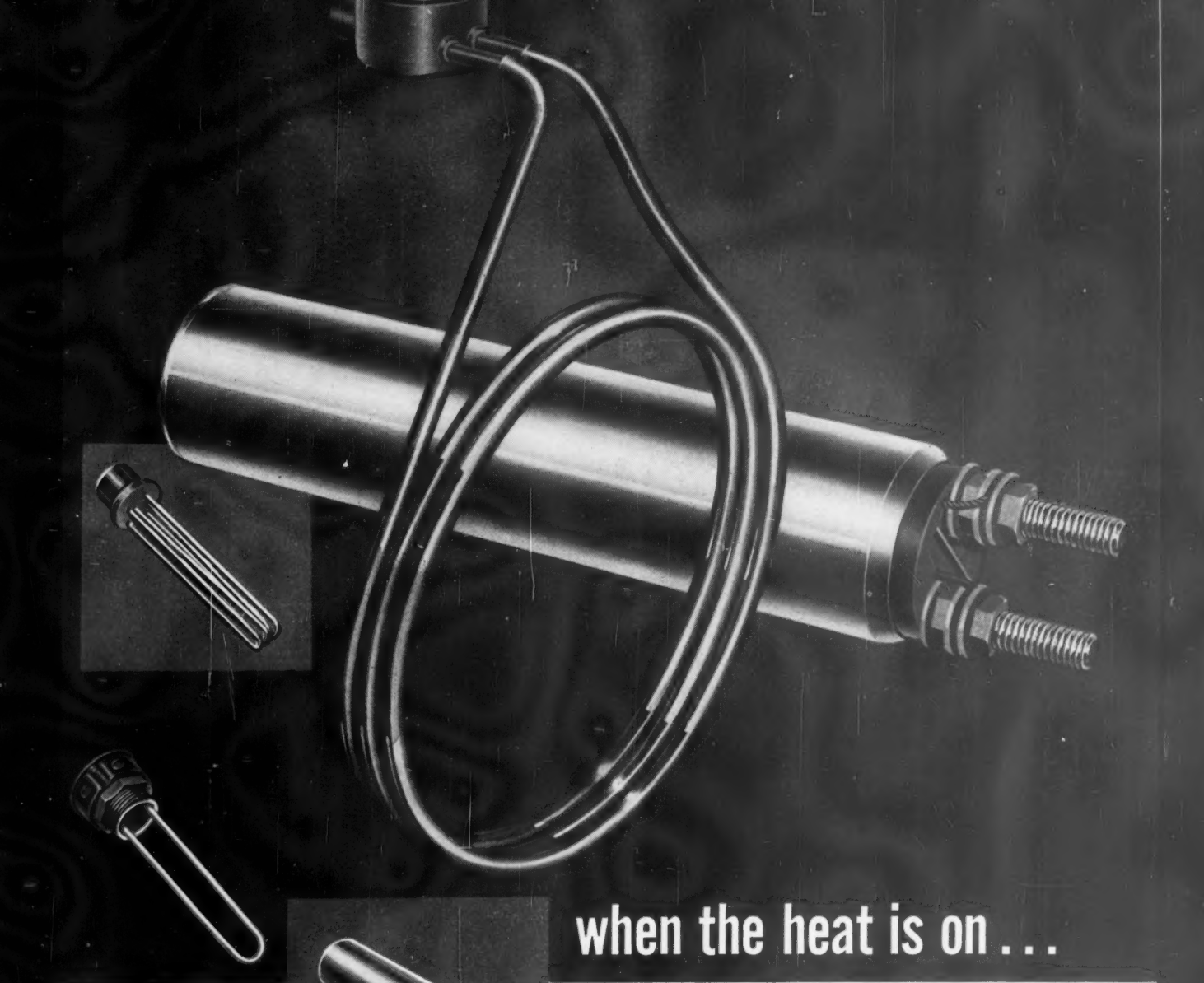
• **Other Advantages**—Fusion would be safer. Since there would be no critical mass, there could be no explosion. Less radiation emission means the radioactive waste disposal problem would be minimized. Finally, because a hydrogen device wouldn't have the limitations of a nuclear reactor, it could possibly be smaller in size. Perhaps even portable in some cases.



A SEMICONTINUOUS CASTING INSTALLATION at Quaker State Metals Co., Lancaster, Pa., division of Howe Sound Co., permits simultaneous production of six 144 x 52 x 7½ in. aluminum alloy slabs. For subdividing and trimming the 12 ft sheet lengths, a high speed circular saw cuts through a 12 x 52 in. section in about 1 minute. The saw is in an overhead sliding carriage and cuts with a 48 in. blade at 6000 ft a minute. The mechanized stock handling equipment combined with the fast feed of the saw allows an operator to run the installation at high production rates. The semicontinuous casting station and the circular slab saw were supplied by Loma Machine Mfg. Co. Inc., New York

Steel Payroll Sets Record

Aggregate payroll for hourly and salaried employees in the steel industry hit $3.9 billion in 1960, says the American Iron & Steel Institute. Prior high: $3.2 billion in 1957.



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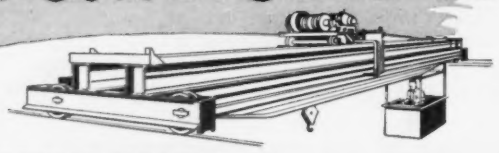

ELECTRIC HOISTS, Also

Euclid Overhead Crane and Semi-Gantry Crane serving the assembly floor of a large machinery manufacturer.

Outdoor Crane equipped with two hoists; also facilities for operating both magnet and scrap iron grapple.

Indoor-outdoor, center controlled crane operating in a large shipbuilding plant.

Underslung, floor controlled crane designed to afford maximum use of a material warehouse.

As proxy battles and pressures for reorganization loom at Chrysler . . .

Colbert Strives for 'Tighter Ship'

CHRYSLER CORP.'S pot of trouble is rapidly coming to a boil. Chances for a proxy fight at the annual stockholders' meeting, scheduled for Apr. 18, are growing—a petition to delay the meeting is pending.

As the pressures mount, President L. L. Colbert is fighting hard to strengthen his management ranks and streamline operations to present a strong case to the stockholders. He faces some rugged hurdles:

1. Sol Dann, the Detroit attorney who has been trying to stir up a proxy contest, got court approval to inspect the firm's list of 90,000 stockholders. Another group which may enter the proxy arena is headed by James Robbins, Royal Oak, Mich., businessman and former Chrysler engineer.

2. The conflict of interest matter is still flaring. At least 11 suits and countersuits involving the company and former employees (including William Newberg, former president) are headed for the courts.

3. Even though Chrysler reported a profit (the first since 1957) of $32.2 million last year, per share earnings are only half the 1951-55 average. Its share of industry sales last year was just over 15 per cent compared with more than 19 per cent in the 1951-55 period.

The closing of the Imperial assembly plant in Detroit was Chrysler's latest move to tighten operations. That plant's operations are being integrated with Chrysler and Dodge facilities on Detroit's Jefferson Avenue. At least two other plants are supposed to close shortly, and the work transferred elsewhere. Chrysler has already sold one of its Ohio plants—only the Twinsburg facility remains. This plant normally employs 3500, but present employment is 2600. The company plans to move more stamping operations to Twinsburg and it may transfer 100 workers from Detroit to Twinsburg.

In January, Chrysler initiated a reported 25 per cent cut in salaried personnel. The move was aimed at gearing operations down to a level that can be supported by a revised 1961 production goal of 700,000 cars or less.

A centralized management group with two sales divisions is shaping up. Engineering, manufacturing, and purchasing are already consolidated. Now it looks like Chrysler, Plymouth, and Valiant will be marketed through one sales group. Another will handle Dodge, Lancer, and Imperial (there has already been extensive reshuffling of sales and marketing executives).

For 1962, Chrysler will have three body shells. Informants say styling and engineering changes are minor.

During this tightening up process, several dozen persons have retired or resigned from the company. Some have been transferred to other jobs or demoted. A few have been asked to resign early. Although

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Chrysler hasn't admitted it, a few employees have been fired.

Industry Watches Cautiously

Chrysler's woes have aroused the concern, and to some extent, the cautious sympathy of the auto industry. Like many a family, they'll fight and feud among themselves but stand together against common foes. Besides, it's easy for autodom to see how conflict of interest situations could develop in an industry where five carbuilders are dealing with more than 324,000 firms that supply goods and services. At Ford and General Motors, for example, there are dozens of crosschecks on all purchasing and engineering activities.

Remember, too, that 30 years ago, the youthful auto companies often had to establish or sponsor suppliers to get the parts they needed when they needed them.

Regardless of what happens in the courts, Chrysler's picture is not bright. But the company isn't apt to fold as some critics suggest. Even in its present straits, it still ranks as one of the country's major manufacturers.

Autodom Sees Faint Signs Signaling March Upturn

AUTOMAKERS and suppliers now indicate that they're expecting an upturn in business activity in March.

Sharp cutbacks in February production will bring inventories slightly below the 1 million mark. Steelmen report booking increased tonnages for delivery to auto plants next month. Dealers say they are beginning to see faint stirrings of sales activity on the part of car buyers.

Car builders now are scheduling only 380,000 production units for February, 50,000 under original schedules. The present forecast for March is 480,000. This would give Detroit a 1.27 million unit output for the first quarter, compared with 2 million a year ago.

Although dealers are reporting a slight pickup in sales of compacts and used cars, they indicate that inventories still are so high they have to discount heavily to make sales.

Ward's Automotive Reports says Cadillac and Thunderbird dealers are carrying less than a 30 day inventory. Lincoln dealers are stocking between 31 and 40 days of cars. (Ben Mills, Lincoln-Mercury general manager and Ford vice president, says March production output schedules will be boosted.) Other models are carrying more than 50 days supply of cars in inventory.

• **GM Optimism**—Edward N. Cole, General Motors Corp. vice president and general manager of the Chevrolet Div., commented in Pittsburgh last week that 1961 could still measure up to a 6.5 million to 7 million car year.

"We think the character of 1961 can be much like 1955," said Mr. Cole, recalling that that year started slowly only to have business pick up strongly in the late summer and fall. "Prospects depend upon consumer confidence—the money is there, the savings are there, and the credit is there."

The Chevrolet executive mentioned "one cloud" which he said hangs over the possibility of the fourth quarter being the best of the year—the expiration of the auto labor contracts. "We hope there will be an equitable settlement on a new contract and that negotiations will not interfere with our capability to produce and sell," he said.

Exhaust Notes

• Power plants for conventional cars aren't apt to change significantly in the next decade, says Lawrence R. Hafstad, GM's research vice president. Speaking before the National Research Council's highway research board, Mr. Hafstad suggested that the fuel cell seems to be the only promising (dark horse) for power plants in the future. He suggests it may provide the breakthrough for an electric car power source.

• Look for plastic accelerator pedals to appear on Ford and Chevrolet cars in 1962—maybe as a running change this year. The molded jobs replace steel and rubber backed pedals.

• American Motors Corp. last week cut the wholesale price of its 100 in. wheelbase American models by 2 per cent. This was accomplished by raising the dealer discount to 23 per cent from 21 per cent without changing the retail sticker price. Thus dealers pay $30 to $40 less per car and have the option of keeping the extra profit or passing some of it on to car buyers.

U. S. Auto Output

Passenger Only

	1961	1960
January	414,498	688,731
February	.....	659,323
March	.....	654,242
April	.....	582,909
May	.....	611,226
June	.....	613,147
July	.....	434,377
August	.....	305,527
September	.....	407,685
October	.....	617,816
November	.....	597,132
December	.....	522,239
Total	.....	6,694,354

Week Ended	1961	1960
Jan. 14	110,808	173,713
Jan. 21	94,155	175,060
Jan. 28	96,057	173,231
Feb. 4	100,589	164,027
Feb. 11	91,614†	153,186
Feb. 18	65,000*	158,898

Source: *Ward's Automotive Reports.*
†Preliminary. *Estimated by STEEL.

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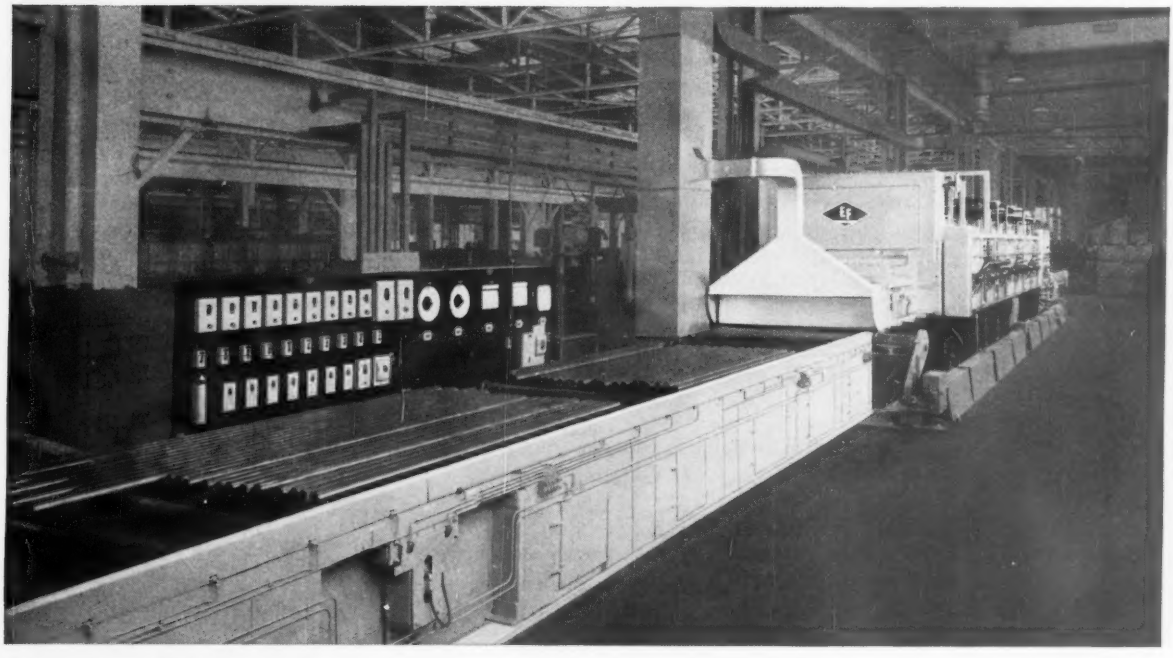

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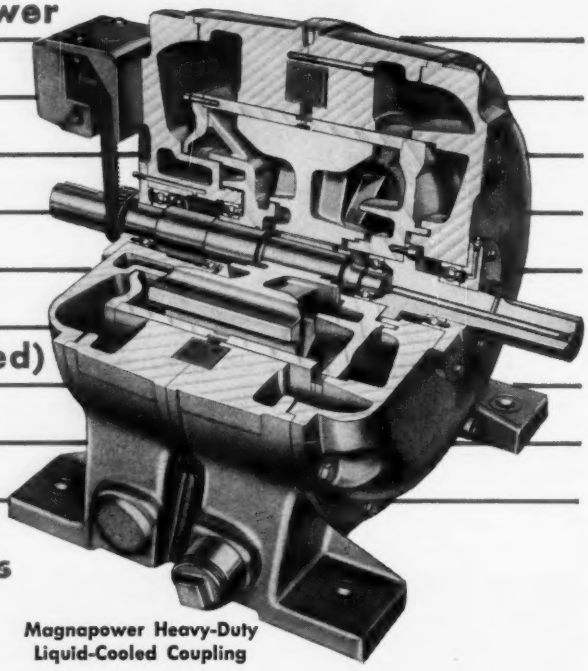

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Buyers Point to Early Business Turn

TAKE A TIP from the purchasing agents: The recession does not have much farther to go, either in depth or in time.

Over the last 25 years, the monthly change indexes developed from the surveys by the National Association of Purchasing Agents and its area business committees "have provided data which consistently have forewarned of turns in business cycles," claims Dr. John H. Hoagland of Michigan State University. "Reductions in the rates of business decline must be achieved before a business recovery can begin," he states. The maximum rates of decline in many facets of business occurred during or before December.

• **Reliability**—Dr. Hoagland feels that the monthly change indexes are of special value because: 1. They are based on reliable reports from important members of the business community. 2. They are available sooner than other monthly business indexes. 3. They indicate rate of change and, therefore, their turning points occur sooner than those of most other business indexes. For instance, in March, 1960, an analysis of six indexes (based on NAPA's national survey and local surveys in New England, Detroit, Cleveland, Pittsburgh, and Chicago) indicated that a business downturn was developing.

Specifically, here is what the indexes suggest in several important areas of business now:

• **New Orders**—The rate of change was at its maximum last November and has been improving steadily since then, NAPA data indicate. But the picture has not been uniform. While the rate is still declining in New England, it has moved into the plus area in Cleveland. The January report from the Purchasing Agents Association of Chicago also shows mild improvement in orders.

• **Production**—In every case, the maximum rate of decrease in production is past. In Chicago, it occurred as far back as August. In New England and Cleveland, production has shown monthly gains.

• **Inventories**—Perhaps the most encouraging sign is the one pointing to an end of the inventory reduction. Again, all the indexes show a relative gain, having passed the peak of liquidation during the fourth quarter. The Chicago group indicates further that a replenishment program is in the offing. Twenty per cent say they will begin to rebuild stocks this quarter; another 21 per cent will start in the second quarter.

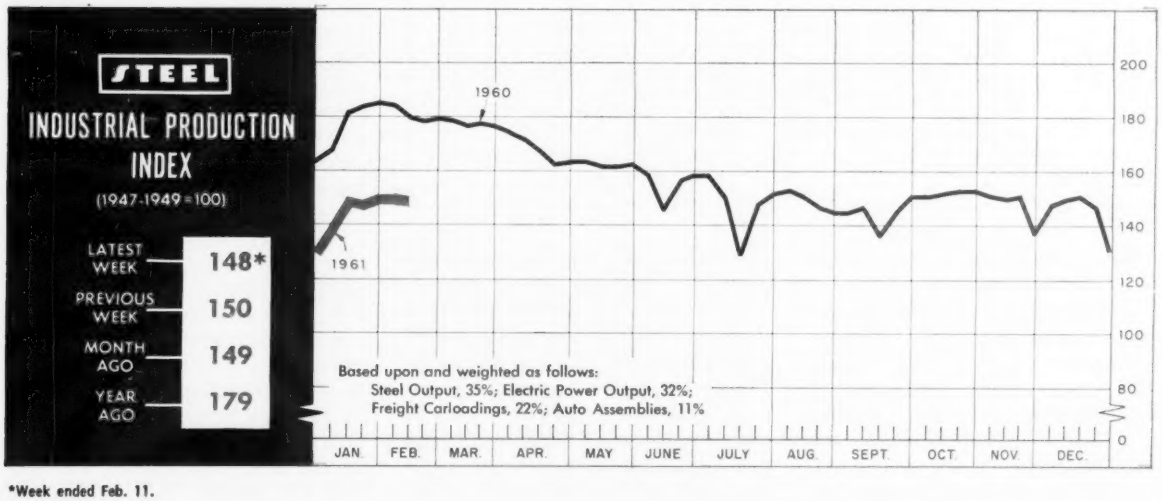
• **Prices** — "One other significant business trend is the firmness of most price indexes," says Dr. Hoagland. But a business upturn and other inflationary pressures may result in price increases, making inflation a possible major problem again in 1961, he asserts.

• **Employment**—This index does not show any significant sign of revival. "Historically, however, turning points in employment usually follow other turning points by a month or two. Thus, January may prove to be the month of maximum rate of decline," Dr. Hoagland points out.

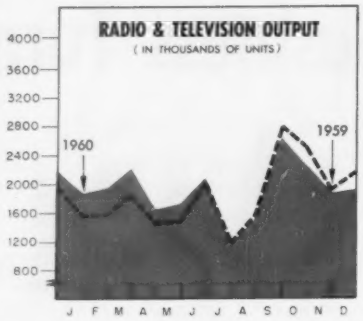
Employment at Record Level

While unemployment continues to grab the big headlines, there are some important points which have almost been buried in the nation's concern for those out of work.

1. To begin with, the current rise in unemployment started from a considerably higher point than has been typical in postwar recessions. This indicates long range problems



*Week ended Feb. 11.



	Radio		Television	
	1960	1959	1960	1959
Jan. ..	1,356	1,125	526	437
Feb. ..	1,442	1,125	503	406
Mar. ..	1,668	1,348	550	494
Apr. ..	1,230	1,040	423	389
May ..	1,277	1,040	442	432
June ..	1,551	1,430	519	571
July ..	890	829	269	350
Aug. ..	1,048	1,009	462	547
Sept. ..	1,945	1,981	679	808
Oct. ..	1,728	1,796	500	707
Nov. ..	1,469	1,316	430	561
Dec. ..	1,522	1,553	405	593
Totals	17,126	15,622	5,708	6,349

Electronic Industries Association.
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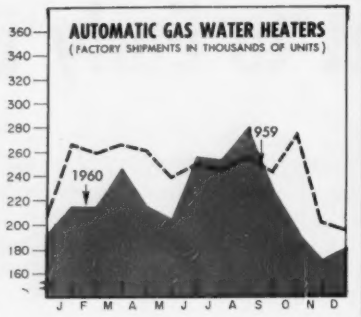
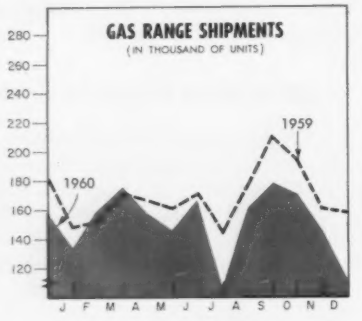


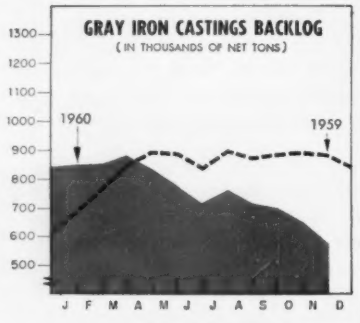
	Shipments—Units		
	1960	1959	1958
Jan. ..	215,500	266,200	235,400
Feb. ..	214,800	259,700	216,300
Mar. ..	247,300	265,900	221,600
Apr. ..	216,200	261,300	221,900
May ..	205,500	239,300	210,000
June ..	256,000	250,000	231,000
July ..	254,100	245,100	221,400
Aug. ..	279,400	256,100	215,500
Sept. ..	227,600	243,800	230,000
Oct. ..	191,800	274,200	265,900
Nov. ..	171,900	199,100	197,100
Dec. ..	181,400*	192,900	207,300
Totals .	2,661,500*	2,953,600	2,673,400

*Preliminary.
Gas Appliance Mfrs. Assn.



	Shipments—Units		
	1960	1959	1958
Jan. ..	133,500	148,700	128,200
Feb. ..	159,500	152,400	134,200
Mar. ..	175,000	171,300	149,300
Apr. ..	156,600	165,800	148,200
May ..	145,600	160,400	147,200
June ..	166,800	171,000	155,900
July ..	105,900	143,800	129,100
Aug. ..	162,800	176,400	157,700
Sept. ..	178,700	210,500	182,300
Oct. ..	169,300	195,000	212,200
Nov. ..	144,500	159,900	171,200
Dec. ..	117,600*	157,100	181,000
Totals .	1,815,800*	2,012,300	1,896,500

*Preliminary.
Gas Appliance Mfrs. Assn.



	Shipments		Unfilled Orders*	
	1960	1959	1960	1959
Jan. ...	1,136	1,002	851	687
Feb. ...	1,108	1,037	855	767
Mar. ...	1,143	1,205	880	847
Apr. ...	1,051	1,246	834	892
May ...	1,053	1,236	782	885
June ...	1,050	1,252	720	838
July ...	803	933	755	898
Aug. ...	859	743	713	873
Sept. ...	900	850	695	883
Oct. ...	905	872	647	887
Nov. ...	836	831	569	885
Dec. ...	....	1,108	...	846
Total ..	....	12,315		

*For sale. U. S. Bureau of the Census.

in the economy which cannot be solved by short term actions.

2. Even under good economic conditions, unemployment rises rapidly between fall and late winter. Thus, the seasonally adjusted rate of unemployment in January dropped from 6.8 per cent of the work force to 6.6 per cent.

3. The rise in unemployment does not stem entirely from workers being laid off. The workforce is expanding by about 1.5 million persons a year. In slow times, some are unable to get new jobs, adding to the unemployment burden.

4. Despite the postwar record of unemployed (5.4 million), there were more people working in January (64.5 million) than ever before in the first month of the year.

While the worst may not yet be over (February and March can be rough months on unemployment, especially if the weather is bad), the outlook is not bleak. A National Industrial Conference Board survey of 160 manufacturing companies reveals that 80 per cent of the respondents expect to increase or at least retain current levels of employment during the next 12 months. Fifty per cent see only normal seasonal fluctuations, while 30 per cent look for increased payrolls. Only 20 per cent expect declines.

It's encouraging to note that the most promising outlook is in the metalworking industry. Thirty-five per cent of such companies look for increased employment and 45 per cent expect stability. Among nonmetal companies, only 24 per cent expect to increase payrolls.

Final Demand at New Peak

Continued high employment is just one of the reasons most economists feel that this will be a short, mild recession. Perhaps more important is the record high level of final demand for goods which persisted at least through the fourth quarter. The effects were most noticeable in the gross national product of $503.5 billion for the period (annual rate, seasonally adjusted). For all of 1960, demand for goods and services prevented the GNP from fluctuating more than fractionally despite a swift and drastic shift in inventory policy by businessmen.

The First National City Bank of New York says that if the inventory factor is taken out of GNP, final demand reached an all-time high of $507.5 billion in the last quarter. "Most major areas of the economy had the benefit of sustained final demand . . . The only marked lag was in residential construction expenditures, which were 12 per cent below the record peak reached in the second quarter of 1959."

The swing from maximum rate of inventory accumulation to maximum liquidation represented about $15 billion last year. "The fact that a cut of this magnitude has been absorbed with only minor fluctuations in GNP is definitely encouraging. At the same time, the estimate that inventories were cut at a $4 billion rate in the fourth quarter indicates that the process of adjustment is

much farther advanced than many observers had believed, and the low point of the decline should be correspondingly nearer."

Strike Affects Comparisons

The steel strike of 1959, credited by many analysts for throwing the business cycle slightly out of kilter, is still plaguing the efforts of the soothsayers to spot the turns in the cycle. For instance, if you keep track of the 12 leading indicators on a year-to-year basis, you find that only five are up compared with a year ago. But in early 1960, the economy was rushing back from the temporary recession caused by the strike, so year-to-year comparisons may be misleading. If you tally the indicators on a month-by-month comparison, the picture looks a little better, with 7 of 12 showing improvement.

Support Available for Upturn

The resources are available to support a rise at any time, especially when considered from the viewpoint of final demand for goods and services. There are two requirements: 1. Sufficient money. 2. Desire.

Considering the still high level of employment along with the built-in stabilizers (such as unemployment compensation, pensions, and other transfer payments), it is not likely that personal income will decline as much in this recession as in past ones. In addition, personal savings are at an all-time high, and they are in relatively liquid form. It remains to be seen how effective the government is in its attempts to pump more money into circulation through insurance dividends, stepped up income tax refunds, and similar devices. But it is safe to say that there is more money available for purchases now than at almost any comparable time in our history.

Many business observers say that one of the biggest hurdles in any recession has been topped—the psychological impact. People have nearly stopped thinking in terms of a coming depression and have now turned their attention to the coming recovery. This can go a long way to reviving the purchasing desires that have been held in check since the fourth quarter. It is also possible that the bad weather, the auto salesman's biggest handicap in January and early February, will show enough improvement to affect sales of autos and other retail goods.

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)	1,540[1]	1,524	2,674
Electric Power Distributed (million kw-hr)	14,775[1]	15,072	14,071
Bituminous Coal Output (1000 tons)	7,440[1]	7,065	8,470
Crude Oil Production (daily avg—1000 bbl)	7,150[1]	7,137	7,256
Construction Volume (*ENR*—millions)	$286.9	$346.4	$374.8
Auto, Truck Output—U. S., Canada (*Ward's*)	121,094[1]	132,023	191,406
TRADE			
Freight Carloadings (1000 cars)	495[1]	498	580
Intercity Truck Tonnage (changes from year ago)	−8.8%	−11.5%	+5.7%
Business Failures (Dun & Bradstreet)	368	400	318
Currency in Circulation (millions)[2]	$31,805	$31,774	$31,599
Dept. Store Sales (changes from year ago)[2]	−5%	−7%	+3%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$27,141	$28,689	$23,785
Federal Gross Debt (billions)	$290.2	$290.9	$291.0
Bond Volume, NYSE (millions)	$35.4	$39.0	$27.5
Stocks Sales, NYSE (thousands of shares)	23,272	24,397	13,484
Loans & Investments (billions, adjusted)[3]	$109.6	$108.4	$102.2
U. S. Govt. Obligations Held (billions)[3]	$30.7	$30.6	$26.4
PRICES			
STEEL's Finished Steel Price Index[4]	247.82	247.82	247.82
STEEL's Nonferrous Metal Price Index[5]	211.6	211.6	234.5
All Commodities[6]	120.0[1]	120.0	119.2
Commodities Other than Farm & Foods[6]	128.1[1]	128.1	128.6

*Dates on request. [1]Preliminary. [2]Federal Reserve Board. [3]Member Banks, Federal Reserve System. [4]1935-39=100. [5]1936-39=100. [6]Bureau of Labor Statistics Index, 1947-49=100.

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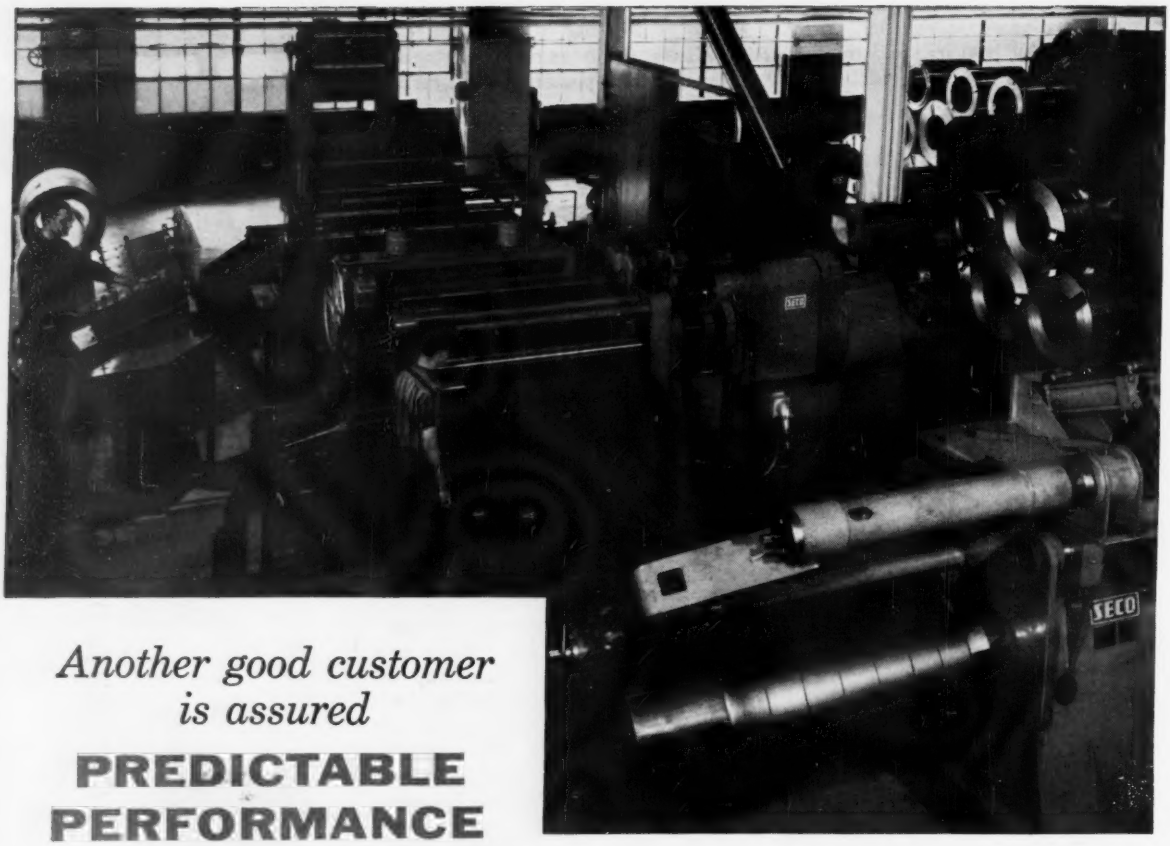

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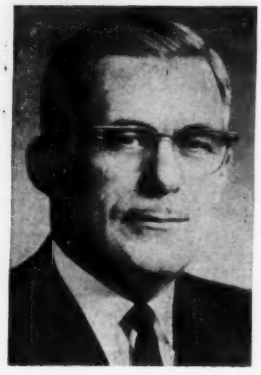


CHARLES S. BESHORE
Yale Materials mfg. mgr.

JOHN L. WILSON
joins Taylor Fibre

BALLARD M. McKINNEY
A-C Terre Haute works mgr.

LESLIE F. SCHURCK
Cooper Alloy gen. works mgr.

Charles S. Beshore was made manager of manufacturing, **Yale Materials Handling Div.**, Philadelphia, Yale & Towne Mfg. Co. He was assistant general manager, Automatic Transportation Co., division in Chicago.

Taylor Fibre Co., Norristown, Pa., appointed **John L. Wilson** manager of its newly created division for production of filament wound, reinforced plastic parts. He was manager of product development at Hercules Powder Co.

Harold C. Sproule succeeds the late **Paul C. Collins** as manager, Hydraulic Div., **Birdsboro Corp.**, Birdsboro, Pa.

William E. Atchley was elected vice president - sales, **National Twist Drill & Tool Co.**, Rochester, Mich. **Fred D. Lamb Jr.** was made general sales manager, and **Howard M. Easton** was made assistant general sales manager. **Rex F. Supernaw** was appointed chief metallurgist.

Ballard M. McKinney succeeds **B. F. Coleman** as works manager, Terre Haute, Ind., Works, **Allis-Chalmers Mfg. Co. M. P. Schmidt** succeeds **Orval T. Neuenfeldt** as works comptroller. Mr. Coleman and Mr. Neuenfeldt transfer to the International Div., where they will carry on investigations concerning manufacturing facilities in foreign countries.

Theodore R. Blessing was made general purchasing agent, **Beryllium Corp.**, Reading, Pa. **Robert L. Krize** was made assistant purchasing agent.

Crucible Steel Co. of America, Pittsburgh, appointed **Henry A. Sturm** product sales manager of tool steel. He was manager, New England region.

Kenneth A. Main was made manager of manufacturing, **Hydreco Div.**, Kalamazoo, Mich., New York Air Brake Co. He was manager of time standards and methods.

Leslie F. Schurck was made general works manager, **Cooper Alloy Corp.**, Hillside, N. J. He joined the company in 1959 as director of industrial engineering.

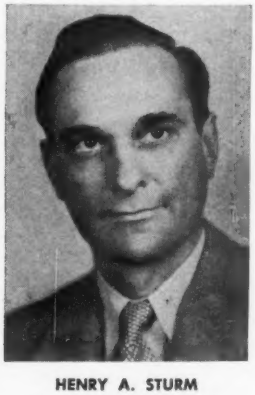
Howard S. Alliton was made vice president and works manager, **Universal Electric Corp.'s** new Ripley, Tenn., plant. He was director of manufacturing for the firm's Owosso, Mich., operations. **James K. Morgan** was named general superintendent-manufacturing at Ripley, and **Jack Anderson** chief of works manager.

Martin B. Powers was made manager of sales administration, **Brush Beryllium Co.**, Cleveland.

Woodrow D. East was made vice president-manufacturing, a new post at **Pittsburgh Metals Purifying Co.**, Mars, Pa.

Richard L. Eubanks was appointed president, **Randall Co.**, Cincinnati, division of Textron Inc., and its subsidiary, **Wagner Mfg. Co.**, Sid-

WILLIAM E. ATCHLEY
National Twist Drill v. p.



HENRY A. STURM
Crucible tool steel sales

KENNETH A. MAIN
Hydreco mfg. manager

RICHARD L. EUBANKS
Randall Co. president

GUS KEULEMANS

JOHN J. COY

American Screw exec. v. p. and v. p.-sales

ANTHONY J. DE FINO

ROBERT N. WARD

Hupp group vice presidents

ney, Ohio. Mr. Eubanks was executive vice president of Randall.

American Screw Co., Willimantic, Conn., division of Noma Lites Inc., elected **Gus Keulemans** executive vice president, **John J. Coy** vice president-sales.

Perfect Circle Corp., Hagerstown, Ind., appointed **G. R. Baer** vice president-operations, **A. M. Brenneke** vice president - engineering, **W. J. Platka Jr.** vice president-international.

George W. Texter was made plant manager, **High Speed Hammer Co. Inc.**, Rochester, N. Y. **R. C. Dublin** was elected secretary to succeed **R. F. Ahlheim**, resigned.

John F. Culp was made general manager, **Sola Electric Co.**, Elk Grove, Ill., division of Basic Products Corp. **H. H. Velten** was made vice president-manufacturing; **D. C. McDonald** director of engineering; **E. E. Bolt** superintendent of the new Power Supply Assembly Dept.

Hupp Corp., Cleveland, in reducing the number of operating divisions reporting directly to the president, elected two group vice presidents. They are **Anthony J. De Fino**, Hupp vice president and general manager of the Perfection Div., and **Robert N. Ward**, assistant to the president.

Raymond P. Spaeth was named purchasing manager, **Detecto Scales Inc.**, Brooklyn, N. Y.

William F. Kast was appointed assistant chief engineer, **Loftus Engineering Corp.**, Pittsburgh. With Loftus since 1955, he has worked both in the office and field.

Robert D. O'Brien was elected president of **Pacific Car & Foundry Co.**, Renton, Wash. He succeeds the late **Paul Pigott**. Mr. O'Brien was executive vice president.

Frank Leonard was appointed vice president for research and development of **Fort Wayne Metals Inc.**, Ft. Wayne, Ind. He continues supervision of executive sales for Michigan.

David McIntosh was made vice president - sales, **Chapman Valve Mfg. Co.**, at Indian Orchard, Mass., which was acquired by Crane Co. in 1959. Mr. McIntosh, with Chapman Valve for 35 years, was responsible for all manufacturing operations at the Indian Orchard plant.

D. A. Atwater and **Robert C. Grund** were named assistant managers of **Republic Steel Corp.'s** Alloy Sales Div. in Massillon, Ohio.

William D. Ownes succeeds **S. A. Keller**, resigned, as general manager, **Heiland Div.**, Denver, Colo., Minneapolis-Honeywell Regulator Co.

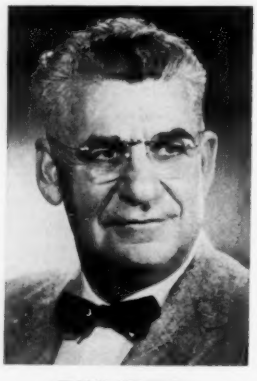
Donal R. Whitney was made quality control manager for **Whitney Chain Co.**, Hartford, Conn., subsidiary of Foote Bros. Gear & Machine Corp. For the last three years, he has been engaged in quality control work in manufac-

JOHN F. CULP

Sola Electric gen. mgr.

ROBERT D. O'BRIEN

Pacific Car & Foundry pres.



FRANK LEONARD

Fort Wayne Metals v. p.

DONAL R. WHITNEY

Whitney Chain quality control

ture of nuclear reactors at Combustion Engineering Inc.

Dr. Theodore T. Magel was appointed director of quality control, **Allegheny Ludlum Steel Corp.**, Pittsburgh. He was assistant to the vice president and technical director.

Edward G. Uhl was elected president and chief executive officer of **Fairchild Engine & Airplane Corp.**, Hagerstown, Md. He replaces **Sherman M. Fairchild** who became acting chief executive officer Oct. 5 after resignation of President **J. H. Carmichael.** Mr. Fairchild has directed a general reorganization of the company. Mr. Uhl was vice president, San Diego, Calif., Div., Ryan Aeronautical Co.

Robert C. Jacobs, assistant general manager, Automotive Gear Div., Richmond, Ind., **Eaton Mfg. Co.**, was promoted to general manager. He succeeds **G. Willard Frame**, retired.

E. L. Coveney was appointed general manager, **Moto-Mower Inc.**, Richmond, Ind., subsidiary of Dura Corp. He succeeds **Donald H. Hartmann.** Mr. Coveney most recently was manager of manufacturing for Montgomery Ward & Co.

Walter R. Clarke was appointed to the new post of product manager in the Marketing Div. of **Square D Co.** at Park Ridge, Ill. He is over product marketing departments of the three manufacturing divisions —in Milwaukee, Cleveland, and Lexington, Ky.

George R. Leonard was made general sales manager of **Twin Coach Co.**, Buffalo. He was manager of aircraft sales for Dresser Mfg. Div., Dresser Industries Inc. Mr. Leonard will co-ordinate sales programs of Twin Coach's Aircraft-Missile Div., Special Products Div., and York Body & Equipment Co., subsidiary.

LeRoy W. Fitzgerald was made assistant to the president of **Fairbanks, Morse & Co.**, Chicago. He was manager of special activities at Convair Div., General Dynamics Corp.

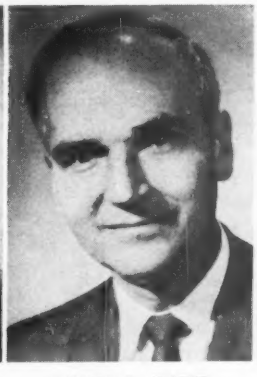
E. B. Germany, president, **Lone Star Steel Co.**, Dallas, will also serve as chairman to succeed the late **Fred F. Florence.**

DR. THEODORE T. MAGEL
Allegheny Ludlum qual. control

EDWARD G. UHL
Fairchild Engine president

ROBERT C. JACOBS
Eaton div. gen. mgr.

E. L. COVENEY
Moto-Mower gen. mgr.



WALTER R. CLARKE
new post at Square D

GEORGE R. LEONARD
Twin Coach gen. sales mgr.

DANIEL C. SWEENEY
Sparton Electronics purchasing

HENRY L. BURGHOFF
Chase Brass research dir.

EDWIN F. KRUZYNSKI
Latrobe production control

Daniel C. Sweeney was appointed purchasing manager of **Sparton Electronics Div.**, Jackson, Mich., Sparton Corp. For the last two years, he served as director of purchasing for Loral Electronics Corp., Bronx, N. Y.

Raymond J. Jacklyn was made manager of **Big Joe Mfg. Co.'s** new factory branch in San Francisco.

Henry L. Burghoff was made director of research and development, **Chase Brass & Copper Co.**, Waterbury, Conn. He succeeds **D. K. Crampton**, retired.

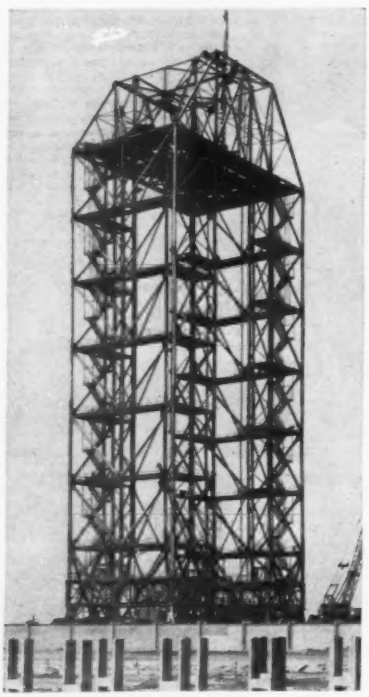
Edwin F. Kruzynski was made manager, Production Control Dept., **Latrobe Steel Co.**, Latrobe, Pa. He was supervisor-production scheduling.

Will Test Use of Natural Gas as Blast Furnace Fuel

UNITED GAS LTD. is constructing a 16 in. pipeline to supply Steel Co. of Canada Ltd., Hamilton, Ont., with natural gas for exhaustive tests as a fuel in blast furnace operation. The project involves an expenditure of $300,000, says T. P. Pinckard, general manager of United Gas.

Of that sum, $90,000 is being spent on the pipeline, with the balance going into the installation of equipment at the service depot to deliver the natural gas under high pressure.

Research into the use of either oil or natural gas to supplement coke as blast furnace fuel has been underway in the industry for some time. The theory is that the injection of supplementary fuel may enable steelmakers to reduce the number of coke ovens required, achieving major savings in capital construction costs.



$3.9 MILLION GANTRY reaches into the Cape Canaveral sky. The 310 ft, 2800 ton, self-propelled tower, being built by Kaiser Steel Corp., will be used in servicing and erecting the Saturn space vehicle

Stelco's experiments with the injection of natural gas as blast furnace fuel are expected to continue for several months following initial delivery about Apr. 1. If the use of natural gas proves feasible, blast furnace operations could become a major market for Western Canadian producers and pipeline operators.

Apollo Changes Name

Apollo Metal Works, Chicago, changed its name to Apollo Metals Inc. The firm produces prefinished metal.

Tyler to Build Plant

W. S. Tyler Co., Cleveland, has awarded a contract (more than $5 million) to George A. Fuller Co., New York, for construction of a manufacturing plant in the Mentor (Ohio) Industrial Park. The 500,000 sq ft plant will produce heavy gage wire cloth and vibrating screen machinery. It is scheduled for completion in June, 1962.

Transfers Steel Interest

Webb & Knapp Inc., New York, has transferred its interest in a project to produce steel from waste copper smelter slag to its subsidiary, Gulf States Land & Industries Inc.

Buys Three Precipitators

Western Precipitation Div., Los Angeles, Joy Mfg. Co., has received a contract to design, produce, and install air cleaning equipment on two oxygen lanced, open hearth furnaces for Republic Steel Corp. at Cleveland. Three electrostatic precipitators are scheduled to go into operation by the end of this year.

Triples Los Angeles Unit

Carpenter Steel Co., Reading, Pa., has tripled its Los Angeles area facilities with the opening of a $300,000 mill-branch warehouse and specialty steel service center at 4423 E. District Blvd., Los Angeles 58, Calif. D. J. O'Neil is Pacific regional manager; Robert W. Titgemeyer, is Los Angeles branch manager. A line of specialty tool, stainless, and alloy steels will be stocked in the 20,000 sq ft facility. The Alloy Tube Div. has established a sales office at the center under the direction of H. L. Harner, the division's Western sales manager.

Enlarges Weldment Dept.

Stupp Bros. Bridge & Iron Co., St. Louis, completed construction of a 40,000 sq ft addition to its weldment department. Equipment includes automatic manipulators, capable of welding speeds up to 105 in. per minute; semiautomatic welders; motor driven, manually guided welders; shielded arcwelders to handle aluminum, stainless steel, and other metals and alloys; welding positioners with 360 degree rotation and 135 degree tilt, and capacities up to 32,000 lb; and a Duograph, simultaneous, multiple pattern cutting machine.

Plans Detinning Plant

Metal & Thermit Corp., New York, plans to erect a detinning plant at Hamilton, Ont. The $1 million facility will be built and operated by its Canadian subsidiary, M&T Products of Canada Ltd. The alkaline detinning process will be used to remove tin from high quality scrap produced in canmaking operations. Byproducts will include sodium and potassium stannate and steel scrap.

The company officially opened its $500,000 detinning plant in Tampa, Fla., on Jan. 31. Construction was begun last August.

Starts Pig Iron Output

Consolidated Mining & Smelting Co. of Canada Ltd., Montreal, Que., has initiated pig iron production at Kimberley, B. C. The $7.5 million plant will eventually have a capacity of 100 tons a day. It is the first stage of a major iron and steel production project at Kimberley. The full project will be an integrated operation, producing (daily) at least 300 tons of pig iron, steel ingots, and basic steel products. Cost: $20 million. A sintering plant and an electrothermic furnace plant have also been completed. The iron

is marketed in 35 lb pigs and in a number of grades, including foundry, bessemer, malleable, and basic.

Kaiser Opens Service Unit

Kaiser Aluminum & Chemical Corp., Oakland, Calif., established Can Technical Service Laboratories at Trentwood, Wash. Purposes: The development of aluminum container specifications to meet selective product requirements, plus a packaging laboratory service to the manufacturing and sales organizations. The facility is headed by W. L. Tibbitts and will operate under the general supervision of J. H. Williams, Trentwood's technical superintendent.

Vibra Screw Expanding

Vibra Screw Feeders Inc., Clifton, N. J., is tripling the capacity of its plant. It's the firm's second.

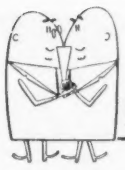
NEW PLANTS

Roll Coater Inc., Pendleton Ind., will complete construction of its $1 million plant in Greenfield, Ind., in April. It will permit the firm to double capacity for painting aluminum sheets and expand its product line. New equipment will include a 400 ft, continuous paint line.

A furnace processing plant has been opened in San Antonio, Tex., by **Stainless Processing Div., Wall Colmonoy Corp.**, Detroit. The plant has high production, pit type, furnace facilities which will handle parts up to 28 in. in diameter by 35 in. high. L. E. McIlvain is manager of the plant.

Consolidated Aluminum Corp., Jackson, Tenn., is operating its new superpurity aluminum plant. It increases production more than 200 per cent. Monthly capacity is 300,000 lb. The product has an average purity of 99.996 per cent, a minimum of 99.992 per cent.

Ward Leonard Electric Co., Mt. Vernon, N. Y., opened a plant at Hagerstown, Md., for the manufacture of molded, metal film, precision resistors. Roger W. Lowery heads the new division.



CONSOLIDATIONS

Stupp Bros. Bridge & Iron Co., St. Louis, purchased **Cal-Metal Pipe Corp. of Lousiana**, Baton Rouge, La., from Cal-Metal Corp., Torrance, Calif.

International Resistance Co., Philadelphia, purchased controlling interest in **North American Electronics Inc.**, Lynn, Mass., producer of semiconductors.

Jack & Heintz Inc., Cleveland, has been merged into **Siegler Corp.**, Los Angeles.

KPT Mfg. Co., a newly formed company in Roseland, N. J., purchased the business formerly conducted by the Kidde Precision Tool Corp., that city. Officers of the new firm include: Chairman, Dr. L. K. Herndon; president, J. W. Mollek Jr.; treasurer, J. R. Evans.

NEW ADDRESSES

Diebel Die & Mfg. Co. moved its operations to its new 35,000 sq ft plant in Morton Grove, Ill.

Lawson Mfg. Co., maker of water heaters, moved its facilities to Oakmont, Pa. Lawson is a subsidiary of Wilson Bros., New York and Louisville.

Nebel Machine Tool Corp. moved its manufacturing, engineering, and purchasing to 600 N. Third St., Hamilton, Ohio. The building has 28,000 sq ft of production space in addition to large office and storage areas. Sales and service offices remain at 3372 Central Parkway, Cincinnati 25, Ohio.

Granco Steel Products Co., St. Louis, moved its St. Louis district office to 1111 Brentwood Blvd., Richmond Heights, Mo. Granco is a subsidiary of Granite City Steel Co., Granite City, Ill.

Ultrasonic Systems Inc. (formerly Ultrasonics Corp.) moved to new quarters at 2255 Carmelina Ave., West Los Angeles, Calif. The firm's expansion plans call for the purchase of additional equipment, broadening its product lines, and ultilization of additional working capital.

Detroit Ball Bearing Co. of Ohio moved its Toledo office and warehouse to 122 S. St. Clair St., that city. The firm stocks more than 46 national lines and more than 22,000 bearing items.

ASSOCIATIONS

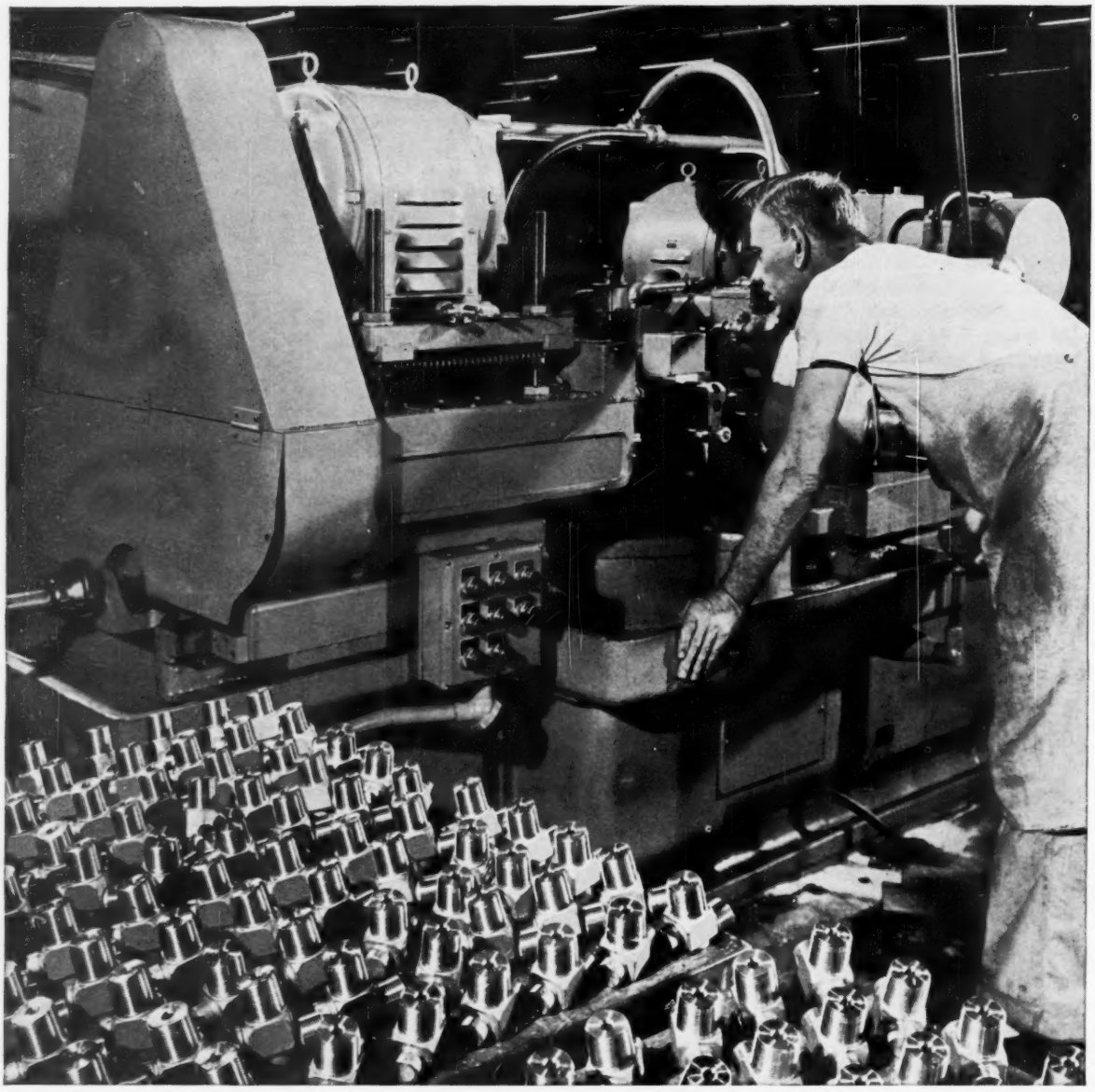
Cutting Tool Manufacturers Association, Detroit, elected these officers: President, W. R. McClure, Eclipse Counterbore Co., Ferndale, Mich.; vice president, M. R. Hemphill, Allegheny Ludlum Steel Corp., Ferndale; treasurer, G. E. Johnston, Star Cutter Co., Farmington, Mich.; and executive secretary, M. J. Ewald.

Institute of Appliance Manufacturers and its publication, *Home Appliance Builder*, moved their offices to 2000 K St. N.W., Washington, D. C.

Compressed Gas Association Inc., New York, elected these officers: President, D. M. Horner, Harrisburg Steel Co. and Taylor-Wharton Co., divisions of Harsco Corp., Harrisburg, Pa.; first vice president, R. S. Passmore, Armour Industrial Chemical Co., Chicago; and second vice president, R. L. Swope, Southern Oxygen Co., Washington. Franklin R. Fetherston was re-elected secretary-treasurer.

Industrial Heating Equipment Association, Washington, elected these officers: President, H. J. Pugsley, Swindell-Dressler Corp., Pittsburgh; vice president, T. H. Wickwire III, Trent Inc., Philadelphia; treasurer, Roy R. Snyder, W. S. Rockwell Co., Fairfield, Conn.; and executive vice president, R. E. Fleming.

American Management Association, New York, has formed a Purchasing Div. It will be headed by Andrew M. Kennedy Jr., vice president of the association and vice president, purchasing and traffic, Westinghouse Electric Corp., Pittsburgh. He will preside over a planning council of 25 leaders in the purchasing field.



TIGHT TOLERANCES DEMAND DORTAN® CUTTING OILS

DORTAN transparent cutting oils provide clear visibility; make measuring and gauging easy; help promote precision and fine surface finishes. Machine operators can flood work and tool areas with a full stream of Dortan and still see what they're doing.

Sulfur, chlorine, and other active agents enhance the excellent machining properties of Dortan cutting oils. Low pour points make handling easy at low temperatures; high flash points help prevent smoking in use. Four grades cover a wide range of machinability from easily machined ferrous and non-ferrous alloys to stainless and heat-resistant steels.

NEBULA® EP is an efficient multi-use grease for most bearings and machine tools. It resists softening which prevents its running out even under extreme heat and pressure conditions. Your Esso Representative can help protect your precision and profits. Give him a call, or write to us at 15 West 51st Street, New York 19, New York.

ESSO STANDARD, DIVISION OF
HUMBLE OIL & REFINING COMPANY

Esso

Technical Outlook

EFFECT ON SCRAP—Economics will continue to have more to do with scrap usage than the continuing trend to basic oxygen steelmaking, thinks R. B. Morgan, Great Lakes Steel Corp., a division of National Steel Corp., Detroit. Plenty of leeway exists in equipment setups to vary the amount of scrap used.

ALLOY PROPERTIES STUDIED—Comparatively recent investigations of the heats of formation in the vanadium-titanium-aluminum metals system has revealed that there is some correlation between the heats of formation and ductility. Data turned up by the study are expected to assist metallurgists in suppressing or eliminating brittleness in some alloys, claim scientists at the National Physical Laboratory, Teddington, England.

NO STICKING—The fact that a Teflon surface on a frying pan prevents sticking (the principal feature of a recent French import of aluminum) suggests that the plastic may offer similar benefits in industrial metalworking areas. As a coating in fairly warm areas, it could prevent buildup of gummy materials, greatly facilitate cleaning.

TV CAMERA SEES RED— An infrared sensitive television camera responds to surface temperatures above 850° F. The developer, Fairbanks, Morse & Co., Chicago, expects the unit will greatly extend the benefits of closed circuit systems for industrial users.

NEW AIR BEARINGS—A rotating cylinder that induces an air film when rotating at high speeds and a porous sintered powder metal are the principal features of two air lubricated bearings developed by Chrysler Corp., Detroit. The designs are expected to aid the missile program.

NEW THERMOELECTRIC CONCEPT— Westinghouse Electric Corp. feels it may have hit pay dirt with an entirely new concept of power generation which it calls the Austin effect. Some combinations of ceramics and metals (for example, iron covered with vitreous enamel and a thin silver plating) produce electricity when heated. The effect doesn't rely on a hot and a cold junction as do thermoelectric converters.

HOT STRAIN GAGES— Strain gages which will withstand 1500° F are "in an advanced stage of development," report Electro-Optical Systems Inc., Pasadena, Calif., and Micro Systems Inc., San Gabriel, Calif.

HYDROGEN INHIBITOR— A simple piece of platinum attached to a tantalum part prevents hydrogen embrittlement, claims Union Carbide Metals Co., a division of Union Carbide Corp., New York. Continuous coating isn't needed. Also, corrosion rate of tantalum not only is unaffected, in some cases it decreases. The findings are expected to increase the application of tantalum to corrosive situations where embrittlement is a problem.

PROGRAMED ELECTRIC ARC FURNACES—An automatic control with a predetermined program of power inputs saves electricity and reduces melting time, claims British Iron & Steel Research Association, London.

NEW CATALYTIC HELPER— A new, intermetallic, lithium platinide ($LiPt_2$) has double the catalytic action of platinum oxide, says Dr. Charles P. Nash, University of California. It's made by melting lithium in a molybdenum crucible, then lowering into the melt a strip of platinum fused to the end of a glass rod. When temperature reaches about 1000° F, a violent reaction takes place to produce the $LiPt_2$. Experts' classification of the new compound: Unexpected.

STAINLESS HANDLES COLD—Recent studies of AISI 301 and 304L indicate that those alloys are useful at −423° F, says Morgan P. Hanson, Lewis Research Center, Cleveland. Cold reduction increases tensile and yield strengths (60 per cent appears best). Reason: Transformation of austenite to martensite.

Boeing Flowspins the Superalloys

. . . forming nose cones, bulkheads, and rocket cases

FLOWSPINNING is getting an increasingly important play in aircraft production.

The main reason, say experts, is that the method will handle the strong alloys needed in supersonic aircraft and missiles.

Flowspinning forms ductile metal cold to the shape of a rotating mandrel by one of several spinning rollers. Metal is thus plastically deformed and progressively displaced by the heavy pressure of the rollers.

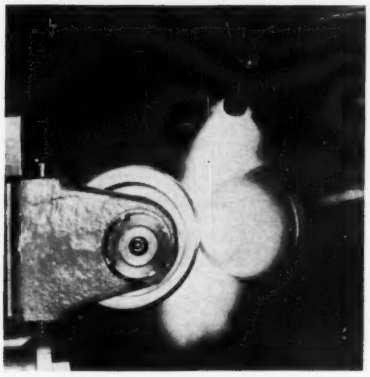
Boeing Airplane Co., Seattle, for example, has power spun X-2219, Vascojet 1000, SAE 4340, and Type 321 stainless. Consider some of the advantages Boeing attributes to the method:

- Difficult to machine alloys are easily formed.
- Waste loss is low. (Almost all the blank is used.)
- Surfaces seldom need finishing.
- Finished parts are considerably stronger than the original blank. (Reason: Work hardening.)
- Parts can be shaped and held to machining tolerances.
- The process simplifies inspection —flaws invariably show up during forming of parts.
- Welded joints are strengthened and otherwise improved.

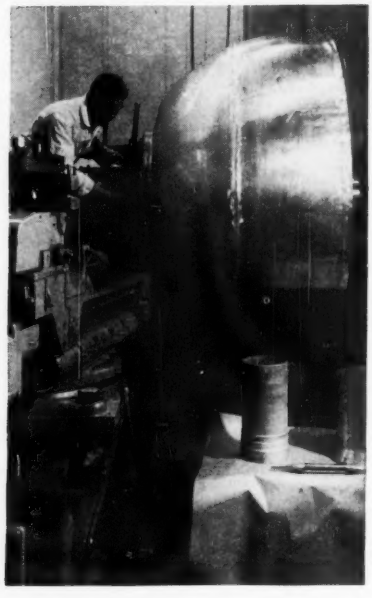
Limitations are few: 1. Shapes must be round and hollow like cylinders or cones. 2. Ductility of finished pieces is considerably reduced, although parts can be heat treated to restore their ductility.

- **Boeing says its approach will work in high and low production, particularly when shapes are too large for your presses.**

Boeing tests on high alloys were completed not long ago. Both



Flowspinning SAE 4130 at 1500° F closes tube ends. Part is finish machined. Flowspun head for an 84 in. cryogenic tank is flow spun in two pieces, welded, then finish spun to final dimensions



welded and plain circular blanks of high strength alloys were spun at room temperatures. Wall thickness, engineers found, could be reduced as much as 50 per cent in one pass and 80 per cent with multiple passes. Tensile specimens showed little essential difference in mechanical properties as related to direction.

Boeing used two test methods. First, maximum reduction of thickness with multiple passes was determined. Parts were spun to a dish-pan shape, annealed, pickled, and trimmed. A second spinning into

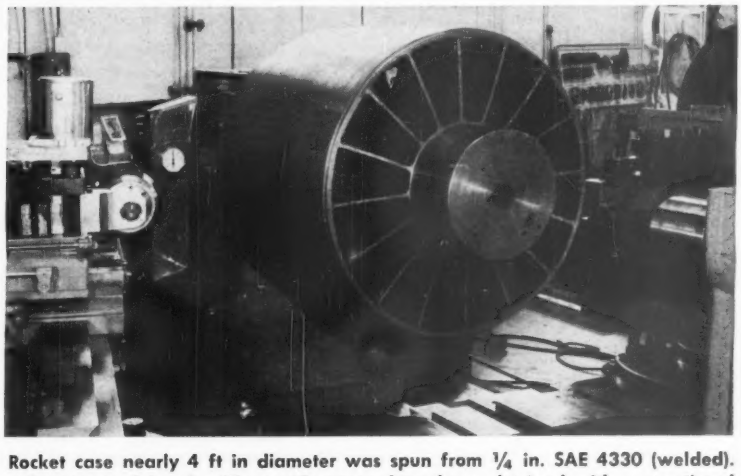
How Far Can You Reduce Thickness?

All the alloys which Boeing was able to spin to shape were also capable of being reduced by flowspinning. This chart will give you an idea of the maximum degree of reduction achieved by Boeing specialists. Tolerances listed below are representative for all alloys tested in preliminary program

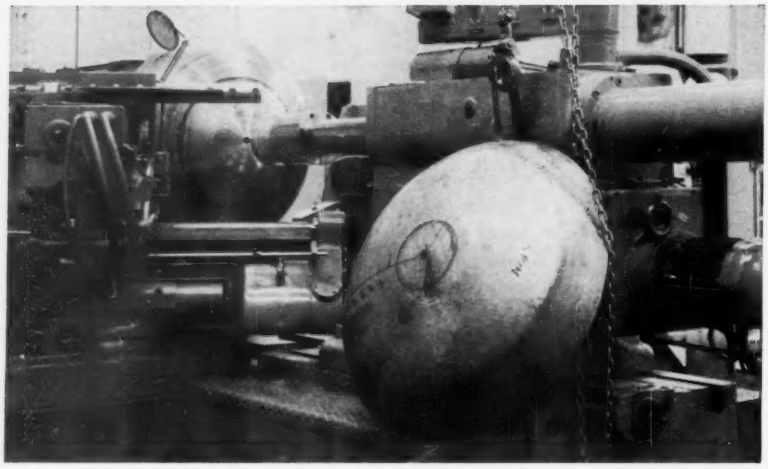
Alloy	Number of Passes	Percentage Reduction
X2219	1	50
X2219	2	70
Vascojet 1000	1	50
Vascojet 1000	2	60
SAE 4340	1	25
SAE 4340	2	75
AISI 321	1	50
AISI 321	2	80
X200	2	50

Flowspun Part Tolerances

	Diameters Up to		
Dimension	30 in.	40 in.	50 in.
Diameter	0.015 in.	0.020 in.	0.025 in.
Concentricity	0.005 in.	0.010 in.	0.015 in.
Thickness	0.003 in.	0.003 in.	0.003 in.



Rocket case nearly 4 ft in diameter was spun from ¼ in. SAE 4330 (welded). Advantages claimed: Closer tolerances than those obtained with conventional techniques; cold working improves weld properties; ends can be thicker



These SAE 4330 (modified) heads were spun in two stages from sheet stock. Tooling is less costly than that of conventional forming processes, says Boeing

a cylinder followed. Walls were finally flowspun to minimum thickness.

The second method established maximum reduction for each pass. Flat blanks were flowspun over a conical block which was progressed in the machine to cone angles of 120, 90, 60, and 30 degrees with corresponding reductions of 13, 29, 50, and 74 per cent. Each material was spun to increasingly severe reductions until a critical point was reached. (Results with various alloys are shown in the accompanying table.)

• Diameter tolerances of 0.010 to 0.050 in. can be achieved. Concentricities can be held within 0.005 to 0.030 in., depending on part size.

When you flowspin cones, flat blank and finished diameters will be the same. Resulting part thickness is a mathematical function of the sine of one-half the included cone angle. Starting blank thickness multiplied by the sine of that angle gives resulting part thickness. The effect: Once a block angle is established, part thickness can be controlled by starting blank gage. In some cases, aluminum for example, variations up to 10 per cent are possible.

The sine law relationship doesn't hold for cylinders. Part thickness is controlled by machine regulation, multiple passes, and between-stage annealing.

• Here are some general rules which Boeing follows. Tooling generally consists of a roller, a spin block, and a special tailstock adapter or follower.

In selecting a roller, consider these points:

For conical parts, roller radius should equal the starting blank thickness. For cylindrical parts, roller radius may vary 10 to 100 per cent of the starting thickness. Generally, the radius should decrease as the strength of the blank material increases.

Spin blocks conform to the inside contour of a part or preform. A variety of materials will work—make your selection on the basis of cost, length of run, blank material being formed, and size. For smaller blocks, choose a tool steel with a surface hardness around Brinell 560 to 600. For larger blocks, cast Meehanite, steel, or Ductile Iron with a compressive strength of 200,000 psi (Brinell 400 to 500) will be satisfactory. You may also find that rolled and welded steel is all right for extremely large blocks where weight is a limiting factor and a small number of parts are to be run.

A follower attaches to the lathe tailstock and helps support the spin block. In many cases, it also holds the blank against the block. It is normally machined from a heat treatable low carbon steel.

In general, Boeing believes, you must consider the recommendations of the lathe manufacturer concerning spin block construction.

X-ray Movies Are Faster and Better

New equipment offers aid to metalworkers in various areas of study and research

INTENSE x-ray motion pictures developed by Zenith Radio Research Corp., Menlo Park, Calif., are so fast they can "stop" a bullet in flight.

The new equipment produces a bright image that can be viewed directly, recorded on motion picture film, or transmitted by closed circuit TV. The x-ray tubes developed by Zenith have a life of more than 1 million shots (their predecessors had a life of several hundred shots, often had unreliable pulse characteristics, and could be pulsed only once every several minutes).

• Expected applications: Studies of shock and vibration, machining techniques, crystal formation.

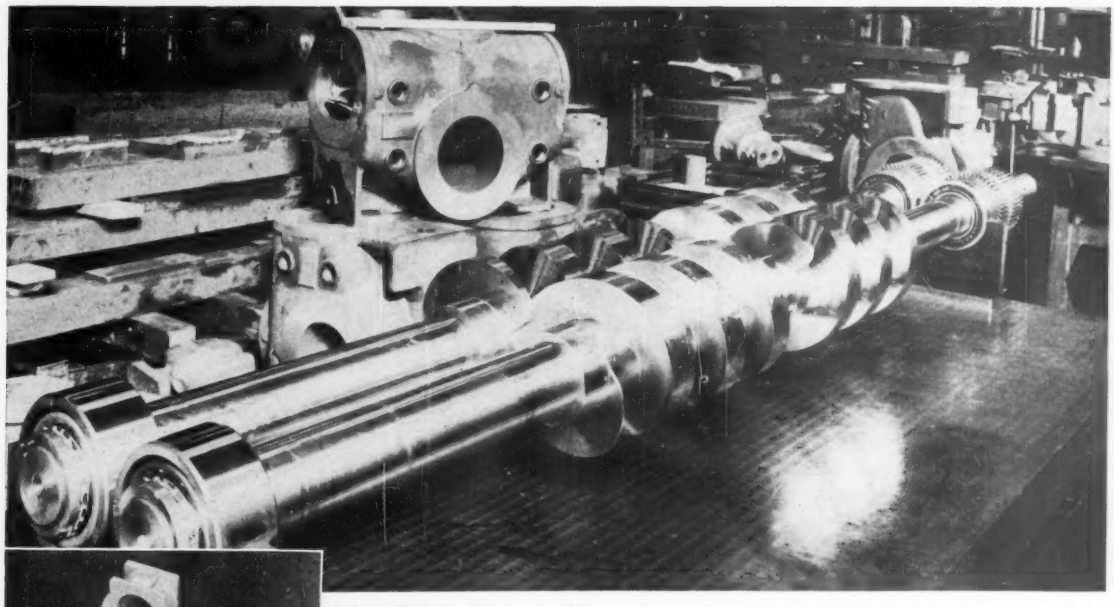
With flashes of x-rays lasting 1 microsecond, Zenith has demonstrated that it can vary the rate of application (pulsing) from 1 to 30 times a second, similar to conventional motion picture speeds. The high powered pulses pass through the subject being studied and impinge on a Rauland image intensifier tube, which amplifies the image and converts it to light.

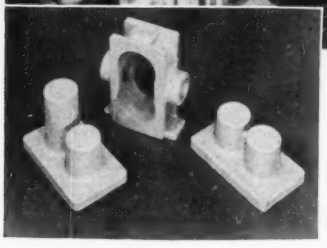
• The system can be fired manually, continuously on a pulse generator, or "slaved" to an external source for stroboscopic effects.

Specialists have been able to observe interior parts of encapsulated assemblies reacting to operating conditions. (The heater of a vacuum tube, for example, is surrounded by metal components.)

In studies of ultrahigh speed machining, observers can watch interaction of obscured tools and metal.

Since pulse length of the x-radiation is so short, experimenters will now be able to analyze molecular and crystalline structure in metal parts of assemblies under operating conditions. Records can be kept, say Zenith experts, of transient crystal formations and transformations, a relatively unknown area in solid state physics.





Sand castings of rotor screws

and shell molded pump assemblies show . . .

Two Ways to Save with Cast Stainless

LOWERING of production costs through the use of stainless steel castings in the manufacture of pumps has been reported by two firms: Empire Steel Castings Inc., Reading, Pa., and Eco Engineering Co., Newark, N. J.

And Empire says size is no barrier: It casts 300 lb rotor screws with finished length of 19 in. (not including shaft extensions) and diameter of 8½ in. and it casts an assembly of three parts weighing 1.6, 2.2, and 1.9 lb each.

• Sand casting of rotor screws at Empire reduced machining time an estimated 25 per cent. Initial cost is also lower due to lighter weight of the section with its cored hole.

In the revised design, the 3 in. core (previously machined from a solid bar of 316 chromium-nickel wrought stainless) is replaced by a 2½ in. hole cast longitudinally through the center of the rotor. The screw pitch is also cast directly with a minimum amount of surface machining required to bring the part to tolerance. Empire casts the part in ACI Type CF-8M stainless (it's a corrosion resistant, molybdenum bearing, stainless similar to 316).

The original bar stock blank from which the rotor screws were made weighed about 428 lb. Machining a 3 in. longitudinal bore and the complex screw threads involved the removal of 128 lb of metal.

Close tolerances are held. The root diameter is held to 0.0015 in. The side profiles and outside diameter tolerances are 0.003 in.

The rotor goes into an external gear and bearing screw pump made by Sier-Bath Pump Co. Inc., North Bergen, N. J. The pump handles nonlubricating fluids and semi-fluids in a viscosity range from 32 to 1 million SSU. All parts in contact with the material being pumped are CF-8M stainless.

• The necessity for strength achieved at low cost influenced Eco to adopt a casting technique for its pumps.

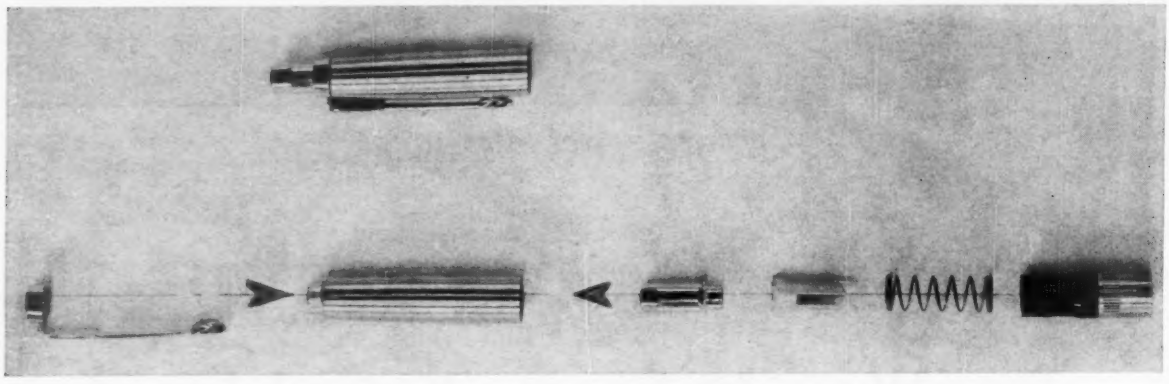
The company says shell molding minimizes problems with surface finish, dimensional accuracy, quality, and machining. It is also using CF-8M.

Patterns are made from special heat resistant iron to maintain dimensional accuracy over repeated runs.

Tight control of the sand resin mix (for the shell mold) and precision regulation of the pouring temperature help maintain the quality of the castings.

Eco's pump is a small unit for handling hazardous, flammable, explosive, and corrosive media. Accuracy and reliability are vital. At flow rates to 10 gpm, with pressure to 100 psi, the pump has a reproducible flow accuracy within ±1 per cent.

How to Evaluate Automatic Assembly of Your Products



Multistation machines join components to make 2880 pen caps an hour . . .

SOME production men think automatic assembly is one of the best remaining ways to make significant reductions in manufacturing costs.

They cite examples like these:

A $59,000 machine that assembles connecting rods is expected to pay for itself (via savings) in a shade under two years, reports an automobile manufacturer.

A machine that automatically assembles caps for Parker Pen Co.'s T-Ball Jotter pens is expected to pay for itself in a year and a half. As a bonus, cap quality has been improved, says Joseph W. Van Camp, Parker's controller.

In both instances, the payoff periods are not unusual, claims Gilman Engineering & Mfg. Co., Janesville, Wis., builder of both machines. Some automatic assembly machines have paid for themselves in less than a year, the company says.

Gilman believes that the automatic assembly market is just beginning to develop. It suggests that answers to the questions that follow can help a prospective user evaluate his need (or chances) for automatic assembly techniques.

• When should automatic assembly be considered?

The three major factors, says Gilman, are production volume, labor cost and time, and the relative stability of part design.

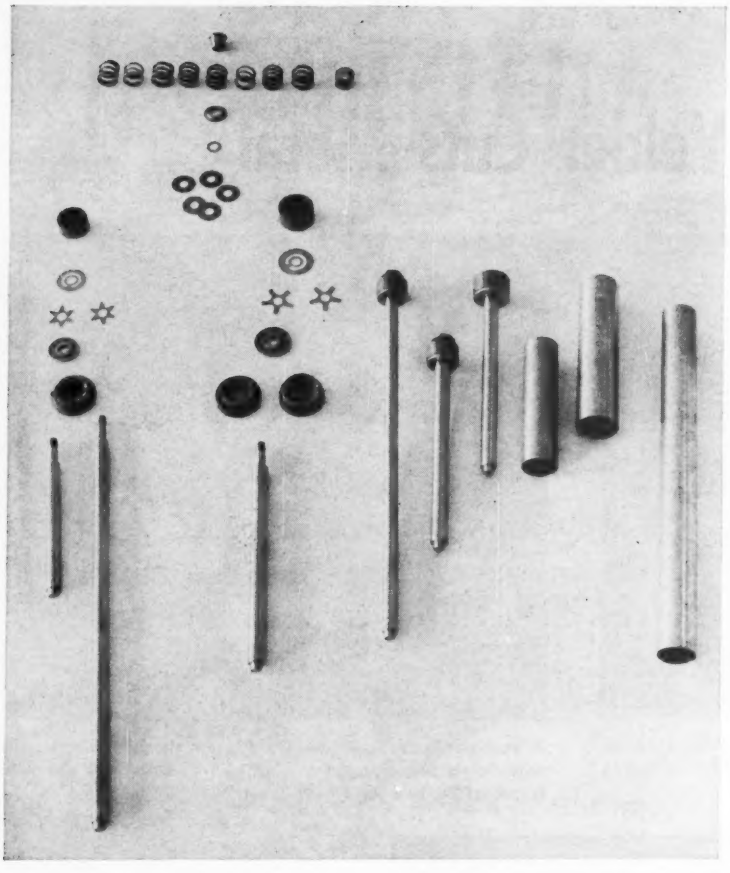
When production volume and the labor content are high (as in automotive parts, appliances, and electronic components), automation of assembly normally pays off handsomely; complete amortization of machines often takes less than two years. If part design is highly stable, the benefits are even more attractive.

When the labor content is relatively low but production is high (as in securing a locknut), the values of completely automatic assembly become dependent on design stability and other factors like quality and reliability of the assembly, flexibility of scheduling, and space savings.

When volume is low but labor content is high (such as in computer assemblies where complexity runs the labor cost up), automatic assembly can be profitable if design is stable to permit a reasonable term for amortization. Another approach: Build the assembly machine to accommodate families of assemblies and to permit some design changes. Machine costs may be high, but benefits include labor saving and improvements in quality and reliability.

• What are the limitations imposed by the number of pieces in an assembly?

In the majority of cases, says Gilman, an assembly incorporating



Or pick parts to make a family of products

a minimum of four to five pieces to a maximum of 12 to 15 pieces is ideal for standard assembly machines. When a minimum is involved, labor costs are apt to be relatively low, so high volume and relatively high part stability are generally required.

With a maximum number of pieces, machine cost is higher, so amortization factors become important.

Also, the quality of parts delivered to the machine must be consistent—this factor will control the efficiency of the machine to some extent.

• Is it practical for a user to tool or retool his assembly machines?

Standard machines, Gilman feels, can be tooled by anyone who is qualified. Normally, the company says, it isn't practical for a user to engineer and build tooling for his first assembly machine because some special understanding of the factors is required.

• What about the cost of retooling for a new assembly or for a design modification?

The company says complete retooling of a standardized Gilman machine may run 30 to 50 per cent of the original machine cost. This may be only one and a half to two times the cost of retooling a hand assembly line where fixtures are used.

• How about quality control on an assembly machine?

Gilman says the primary quality control jobs done on its machines are: Checking the assembly to assure that the proper part is loaded at the right time; making sure that no assemblies go through with parts missing; making a functional check on the assembly when it is necessary. In nearly every case, machine inspection is faster and more reliable than manual or visual inspection.

• How can you increase machine flexibility to accommodate families of assemblies?

Standardized movement in the work stations is the answer. Stations can be provided to handle the special parts not common to all assemblies in the family—a switch can be flipped to lock out or actuate those stations as needed. One Gilman machine uses the principle to assemble 27,000 standard stock items in a family of electrical parts.

If the assembly requires parts that can't be accommodated by lockout, station functions can be done manually. The feature also makes it possible to handle short runs incorporating different parts without the expense of special tooling.

• Are there any special problems in debugging automatic assembly machines?

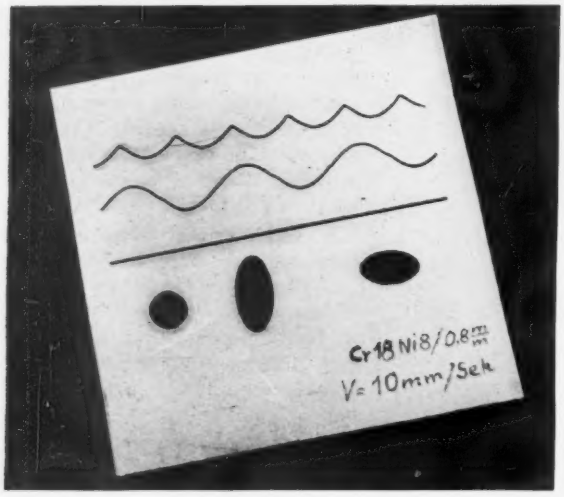
Gilman says the job is comparable to debugging any machine that has special tooling or components which must be synchronized and operate in sequence. It's advisable to have a substantial quantity of parts run through the machine before it goes into production, the company feels. In addition to revealing machine performance, test runs also show up any variables in the parts being handled. Faulty parts can affect machine efficiency—the machine may have to be modified to handle minor variations in parts, or the quality of the parts may require improvement. It's important to know such things before you count on the machine for full production.

• Is there a place for numerical control in short run automatic assembly?

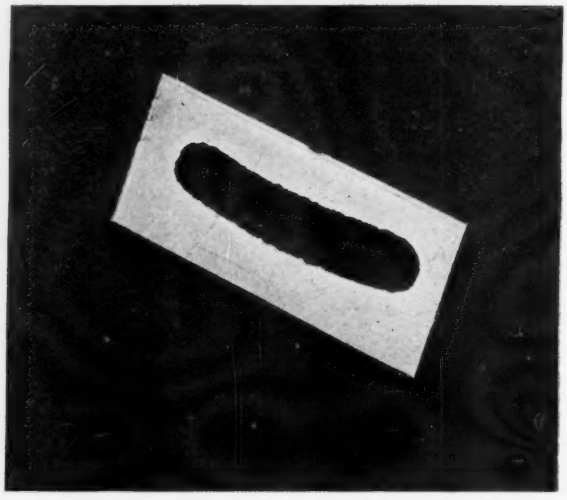
Gilman engineers say it is reasonable to assume that tape controlled machines can be used to handle relatively short runs of similar assemblies. The investment in these machines will be high, but their versatility will make them economically practical.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

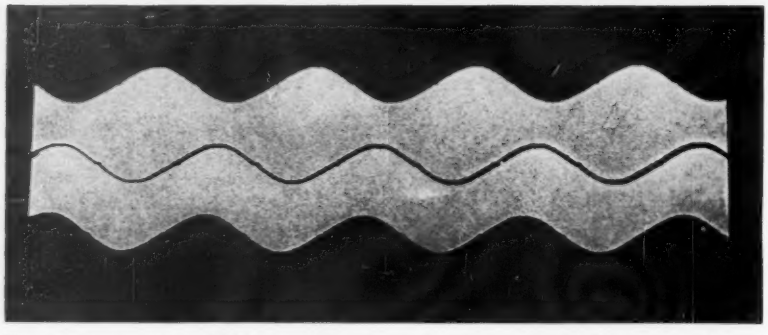
Electron Beam Welder Cuts Metal



These cuts in 18-8 stainless steel (0.033 in. thick) were made at a speed of 24 in. a minute. The slits are 0.025 in. wide



A turbine blade will be welded in this aperture. The material is Nimonic, 0.04 in. thick. The cut was made at a rate of 24 in. a minute



This sine wave slit is 0.025 in. wide. The cut was made with the electron beam at 48 in. a minute. The contour is provided by deflecting the beam as the work feeds past. The material: Carbon steel 0.033 in. thick

ELECTRON BEAM welding machines normally aren't thought of as metal cutters. But all the machining shown above was done on a conventional Zeiss welder—at rates and precision levels that would justify them for production.

Nearly all electron beam machining to date has been done on "milling machines" with special beam focusing.

The milling machines can bring the beam spot down fine enough to drill a hole only 0.0005 in. in diameter—and the hole can be in nearly any material, including gems. Minimum size is 0.005 in., says Hamilton Electrona Inc., New York, U. S. licensee for Zeiss. On both machines, the repeatability is said to be excellent.

Such double duty should be attractive to companies in specialized fields. Electronics is a good example.

• Electron beams have also been tried for spot alloying and spot "bleeding."

Put a dab of alloying element on a base metal, hit the spot with an electron beam, and you'll produce a highly localized zone of alloyed material. Makers of electronic equipment are examining that technique also for future application to modules.

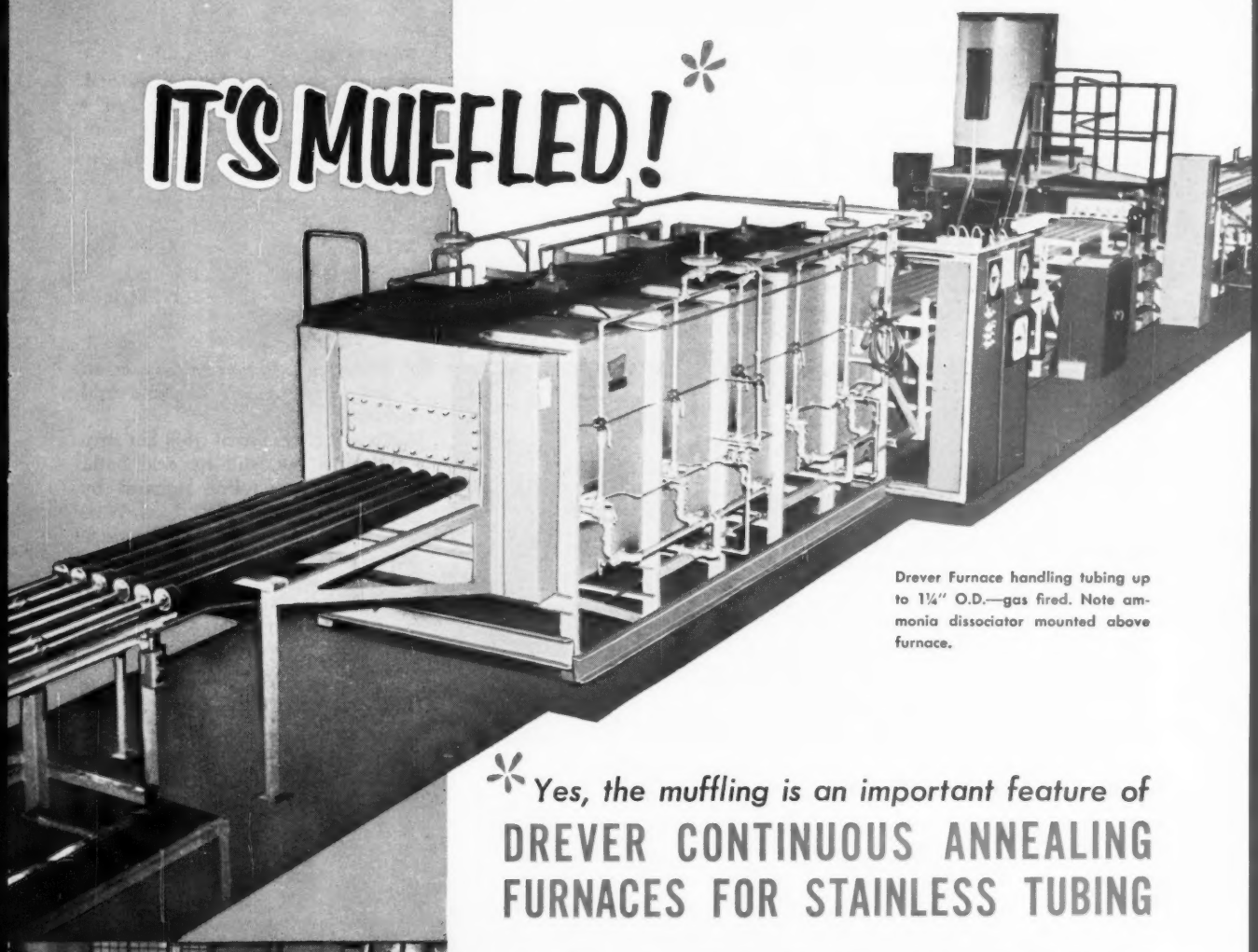
Researchers have also found that metal can be bled up through a drilled hole. For example, in a part made with silicon laminated to indium, they have drilled a hole through a silicon sheet, then the indium flows up through and fills the hole. The principle may have an electronics application.

The latest machine innovation Hamilton Electrona reports is a flying spot scanner that will read a drawing, then control the beam to generate the same pattern on the workpiece.

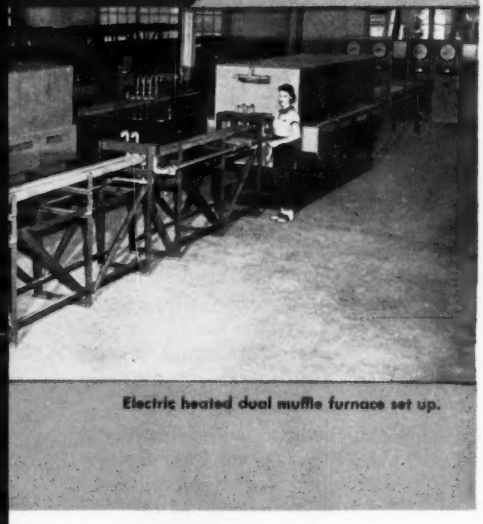
• Such developments should spur new applications for electron beam processing, says Hamilton Electrona.

Even though the techniques are for highly specialized problems, applications of electron beam metalworking are expected to multiply in the next few years (STEEL, Sept. 12, p. 124, 1960).

IT'S MUFFLED!*



Drever Furnace handling tubing up to 1¼" O.D.—gas fired. Note ammonia dissociator mounted above furnace.



Electric heated dual muffle furnace set up.

Yes, the muffling is an important feature of

DREVER CONTINUOUS ANNEALING FURNACES FOR STAINLESS TUBING

The muffles permit rapid heating of the tubing under the controlled atmosphere —and the economical use of this atmosphere because of the limited volume required. Add to these the flexibility of operation, and the fact that failure of one muffle does not require complete shut down of the furnace. A unique conveyor design eliminates or minimizes scratching or marking of tubing. Drever Multiple Muffle Furnaces can be built to handle tubing from hyperdermic sizes on up.

DREVER SPECIALIZED FURNACE ENGINEERING

The design of industrial furnaces, quenches, atmosphere equipment and associated handling devices has been a Drever specialty for many years. Research and investigation to advance the processes has been going on continuously.

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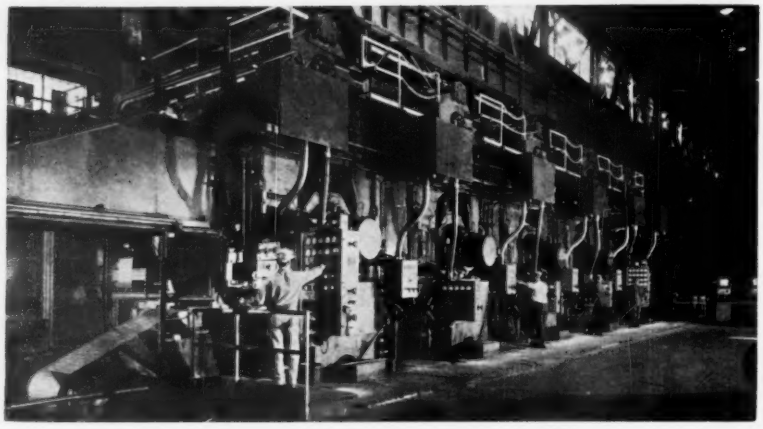
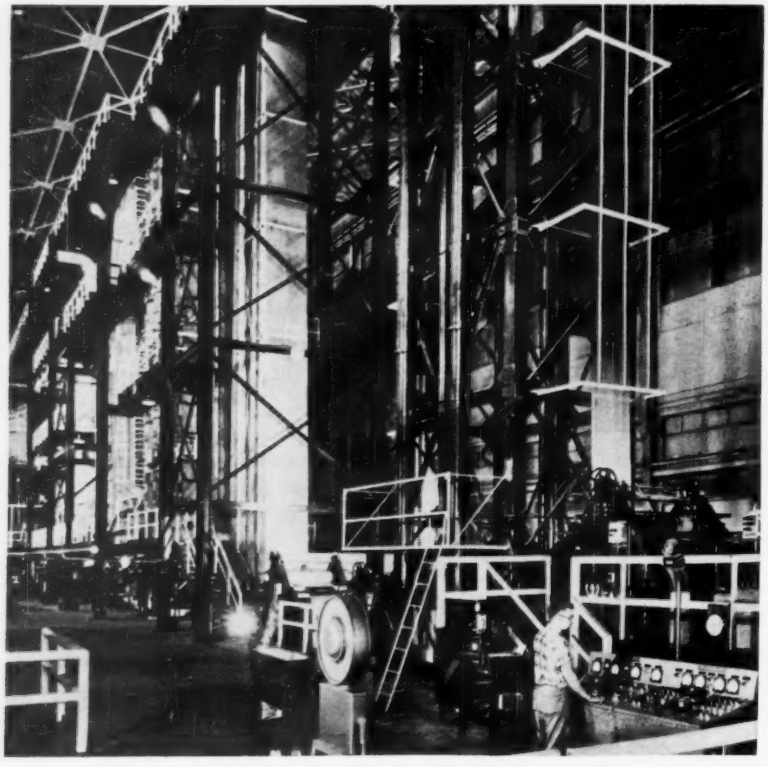
PROGRESS IN STEELMAKING

Modernized Tin Plate Plant Makes More Sizes Available



New, cold reduction mill rolls wider strip . . .

. . . continuous line anneals the material faster



FABRICATORS of flat rolled steel products are getting the gages and sizes they want from more sources as producers put bigger, faster, more flexible equipment into use.

Example: Longer, wider coils (and thinner gages) of tin plate and black plate are available from Wheeling Steel Corp., since the company modernized its Yorkville (Ohio) Works. The cost: $38 million.

• Wider strip is processed faster on a new, acid pickling line and cold reduction mill.

Oxides are removed from hot strip coils by a hot, sulfuric acid bath, on a continuous line supplied by Wean Engineering Co. Inc., Warren, Ohio. The coils are side trimmed and coated with palm oil to inhibit rust and lubricate the strip for subsequent rolling. Cleaned steel comes off the line at speeds up to 600 fpm.

Closer control of thickness is made possible on the new, 48 in., tandem mill, by automatic gage control employing radioisotopes. The five stand, four high mill, built by Mesta Machine Co., Pittsburgh, reduces strip thickness from about 0.080 in. to 0.011 in. (average). The mill has a rated maximum speed of 6000 fpm.

An older five stand, 42 in., four high mill is being kept on standby.

• Workability wanted by the fabricator is produced with new batch and continuous annealing facilities.

"How the customer plans to use the product helps determine where it is to be annealed," says George A. Scheetz, general manager at Yorkville. "For some special applications, such as extremely deep draws, material is batch processed in the company's new portable annealing furnaces. Several other grades of material are handled on our continuous cleaning and annealing line."

New alkaline and electrolytic cleaning lines take oil from tandem rolled strip. Then small coils are combined to make larger ones for annealing in the portable furnaces. The coils are stacked on an annealing base, covered, and heated in a protective gas atmosphere, which guards the steel from scaling or oxidizing.

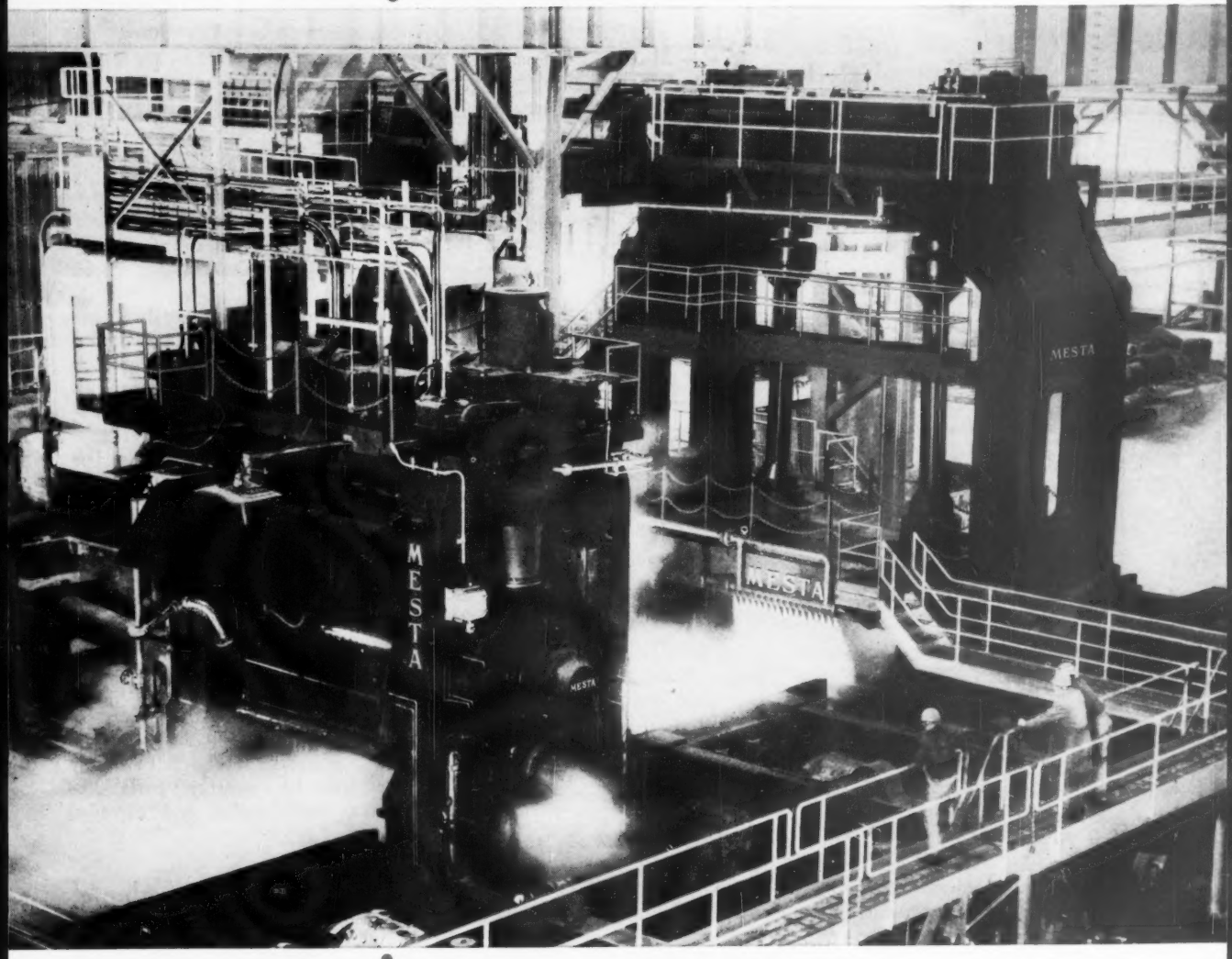
Coils to be processed on the con-

DESIGNED AND BUILT BY

MESTA

FOUR-HIGH REVERSING MILL and VERTICAL EDGING MILL for SLABS and PLATES

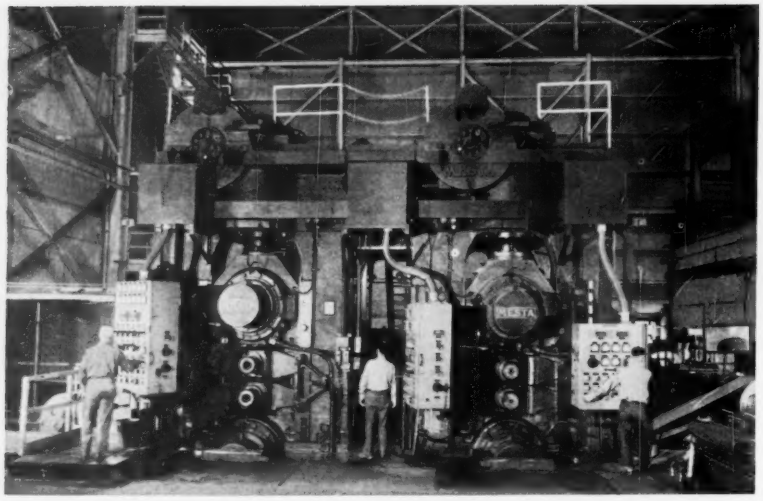
At Lukens Steel Company, the 140″ Four-High Reversing Plate Mill and Vertical Edging Mill is an unusual installation. Although this mill is operating primarily as a slabbing mill to reduce ingots into slabs for rolling plates on other mills, it can complete the rolling of plates to finished sizes directly. The Vertical Edging Mill, largest ever used in tandem with a Plate Mill in this country, provides edge rolling of the ingot which remains in the horizontal position during the complete operation. This installation is the major unit which will increase the plate rolling capacity at Lukens by 40 per cent.



Designers and Builders of Complete Steel Plants

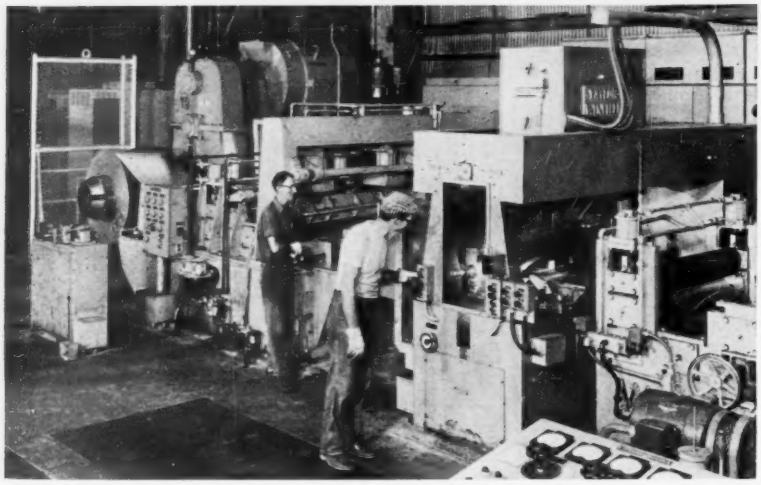
MESTA MACHINE COMPANY

PITTSBURGH, PENNSYLVANIA



New temper mill flattens, finishes the strip . . .

. . . black plate coils are prepared for shipment



tinuous annealing line are cleaned electrolytically. Then they pass through the heating, holding, and cooling sections of the annealing line, which was built by the Industrial Heating Dept. (Shelbyville, Ind.) of General Electric Co. Gas burners are used in the heating section.

• Customer requirements for flatness, temper, and width are met by new or updated finish rolling equipment.

Flat strip of specified temper and finish is rolled (after annealing) on a new, 48 in., temper mill. The two stand, four high mill, made by Mesta Machine, has a rated maximum speed of 5000 fpm.

Two older 42 in., four high temper mills, still in use, have rated speeds of 2050 fpm. New equipment on the entry end makes it possible for one of the mills to handle larger diameter coils.

• The ratio of sheets and coils in the plant's output can be varied more easily, thanks to modifications made on the tin coating lines.

Electrolytic tin plate strip is rewound for shipment in coils, or cut into sheets.

Efficiency in the production of hot dip, tin plate sheets has been improved by mechanizing the feeders, picklers, tin pots, and cleaners.

Chemical Treatment Protects Surfaces

"A SIMPLE chemical immersion gives our valves and gages a good black finish with superior corrosion resistance," states James A. Ford, vice president and general sales manager, Jerguson Gage & Valve Co., Burlington, Mass.

The rustproofing to which he refers is a process (Endurion) which first produces a phosphate coating on cast iron or steel, then converts it to a complex tin compound. The coating is dense, inorganic, integral with the metal, and has only a negligible amount of buildup. Finish is said to be fine textured and smooth. Dyeing can be employed for a wide range of colors.

• Reaches Difficult Places—Jerguson turns out a variety of valves, gages, and liquid level indicators for steam, chemical, and nuclear installations. Such parts have many hard to reach interior and threaded areas, deep recesses, and blind holes.

Close tolerance dimensions have previously made other methods impractical because of their buildup characteristics. Also, paints or oils aren't permissible on nuclear equipment.

Here are some of the results Jerguson claims it achieves with the coating:

1. A government specification grade of rustproofing 0.0002 to 0.0003 in. thick which withstands 12 to 20 times more exposure than conventional coatings.
2. A characteristic color finish, easily identified.
3. A superior base with a microscopic tooth for bonding paint to metal.
4. A quality of lubricity highly effective on wearing parts like cams, levers, gears, and threaded parts.

Tiny Capacitors Developed

Radio Corp. of America has developed miniature, solid tantalum capacitors which it plans to produce commercially in mid-April. Expected uses: Space vehicles, computers, data processing, communications, and airborne equipment.

Electric and open hearth steel castings from 1 lb. to 100 tons.

Rolling on a PITTSBURGH Breakdown Mill at ANACONDA ALUMINUM

As a major part of an extensive expansion program at its Terre Haute, Indiana plant, Anaconda Aluminum Co. has installed this PITTSBURGH 66-inch four-high cold rolling Breakdown Mill. This equipment produces aluminum strip with a minimum thickness of .012" up to 60" wide at a speed of 1,200 feet per minute to help meet the increasing volume of orders specifying exacting gauge tolerances and surface quality. The mill also produces foil stock for Anaconda Aluminum's Foil Division at Louisville, Kentucky.

Important design features of this PITTSBURGH mill include hydraulic roll crown control, special reel drives to provide added flexibility and strip gauging equipment for automatic gauge control.

For all your requirements in rolling mill equipment and related facilities, contact PITTSBURGH.

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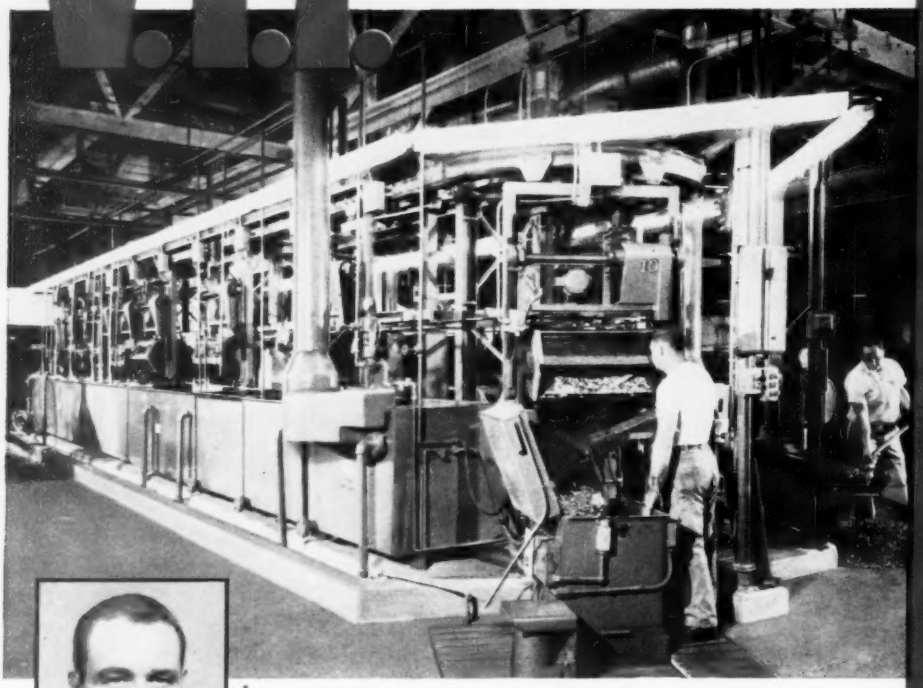


* Variable Integrated Processing steps-up production, improves plating efficiency for Chrome-Rite Company

Chrome-Rite Company, Chicago, Illinois, a large job plating shop, recently selected and installed a Udylite V.I.P. Automatic Barrel Plating Machine to replace a manual line for zinc plating bulk parts.

"We find that our direct labor cost has been cut 60% while the cost of materials has decreased approximately 15%", writes Bill Crawford, Vice President. "In addition, we are now able to handle about 99% of our zinc plating volume on the new V.I.P. and maintain an even more consistent high finish-quality than ever before."

Experienced plating men like Bill Crawford are quick to note the many production plating advantages of the V.I.P. You, too, should consult your Udylite Sales Engineer for complete information on the versatile V.I.P. Call him today. Or, write:

Udylite corporation
detroit 11, michigan

Cites New Uses for Thermoelectrics

Materials open the way for a variety of temperature regulating and cooling devices

PRESENT thermoelectric materials are good enough to make feasible a variety of temperature regulating and cooling devices, claims Irving I. Sochard of the Army's Diamond Ordnance Fuze Laboratories.

He says that one of the better applications for the devices is in military semiconductor electronics. Most military electronic units must operate in temperatures ranging from $-65°$ F to 160° F. In many circuits, about half the components are needed to provide that temperature compensation or to make up for losses due to such compensation.

Mr. Sochard says a properly designed thermoelectric device, with appropriate sensing and control elements, can maintain the electronics at a temperature within a selected range (say between 68° F and 86° F) while the surrounding temperature varies from $-65°$ F to 160° F.

• **Other Benefits** — He says the thermoelectric device offers three additional benefits:

1. It will reduce development time for electronic equipment since the temperature compensation problem will be eliminated.

2. It will increase circuit reliability since fewer components will be needed.

3. The cost can be reduced. Mr. Sochard says the cost reduction could be substantial in dense electronic packaging where the electronics cost may be around $2000 per cubic inch, while the thermoelectric device to control the temperature of that volume will cost about $100.

Mr. Sochard has designed, built, and tested such a thermoelectric device. It is compatible with conventional power supplies, lends itself to a wide range of designs, and can be produced with common techniques. It is composed of 18 thermocouples, operates at 1.5 to 2 volts at input powers up to about 6 watts.

Jumbo Pump Impellers Cast In CO_2 Type Molds

CORES and the mold for casting four, 10,000 lb pump impellers were made by the CO_2 process at Bethlehem Steel Co.'s San Francisco shipyard.

The reason: A firm, hard mold surface was necessary to resist erosion during pouring and produce a smooth surfaced casting. In the CO_2 process, the molding medium—sand was used by Bethlehem—is prepared with a material containing water glass. Applying CO_2 to the mold surface creates a reaction that primarily forms sodium carbonate.

The parts (60 in. in diameter by 45 in. high) will be used in high lift, vertical diversion pumps. The material is high tin, manganese bronze.

To assure casting solidity, an annular riser or shrinkage head was placed over the heavy plate section to which the four impeller vanes are attached.

Bottom gating permitted the metal to rise and fill the mold cavity from the lowest point.

• **Drag and Cope**—The drag or bottom half of the mold was formed in a flask. The four vanes were molded individually by a corebox generating the curved sides of the impeller blades. The cope was formed of two covering cores using an arbor to hold the parts in proper relationship to each other and to the mold.

To prepare for the casting, the vane cores were first assembled on a lifting plate outside the mold. The assembly, firmly held together as a unit, was placed in the drag. The covering cores were then carefully placed on the drag.

After checking for positioning accuracy, the two units were secured together and molten metal (1850° F) was introduced through the gating system. The complete pour for each impeller took only 4 minutes.

Computer System Monitors Quality

Results of tube life tests are recorded on tape

THE MANY advantages of a computer in evaluating product quality are demonstrated daily at Sylvania Electric Products Inc., a subsidiary of General Telephone & Electronics Corp., New York.

Sylvania tags these major benefits in its testing program for electronic tubes:

- The procedure minimizes or eliminates human error.
- With the employment of automatic machinery, two people now do a much better job than the eight formerly required.
- Errors or deviations turned up in the testing program can be corrected in the production system in only 2 hours compared with 8 formerly. In practically all cases, error trends are anticipated and corrected before they occur.
- Quality readings are more precise and accurate than they were.

• All tubes are tested. Samples are given life tests and checked at regular intervals during the run.

Sylvania has developed a testing machine which continuously checks tubes for up to 23 characteristics while they move along a conveyor. All tubes which pass through the device conform to a basic standard (no shorts, for example).

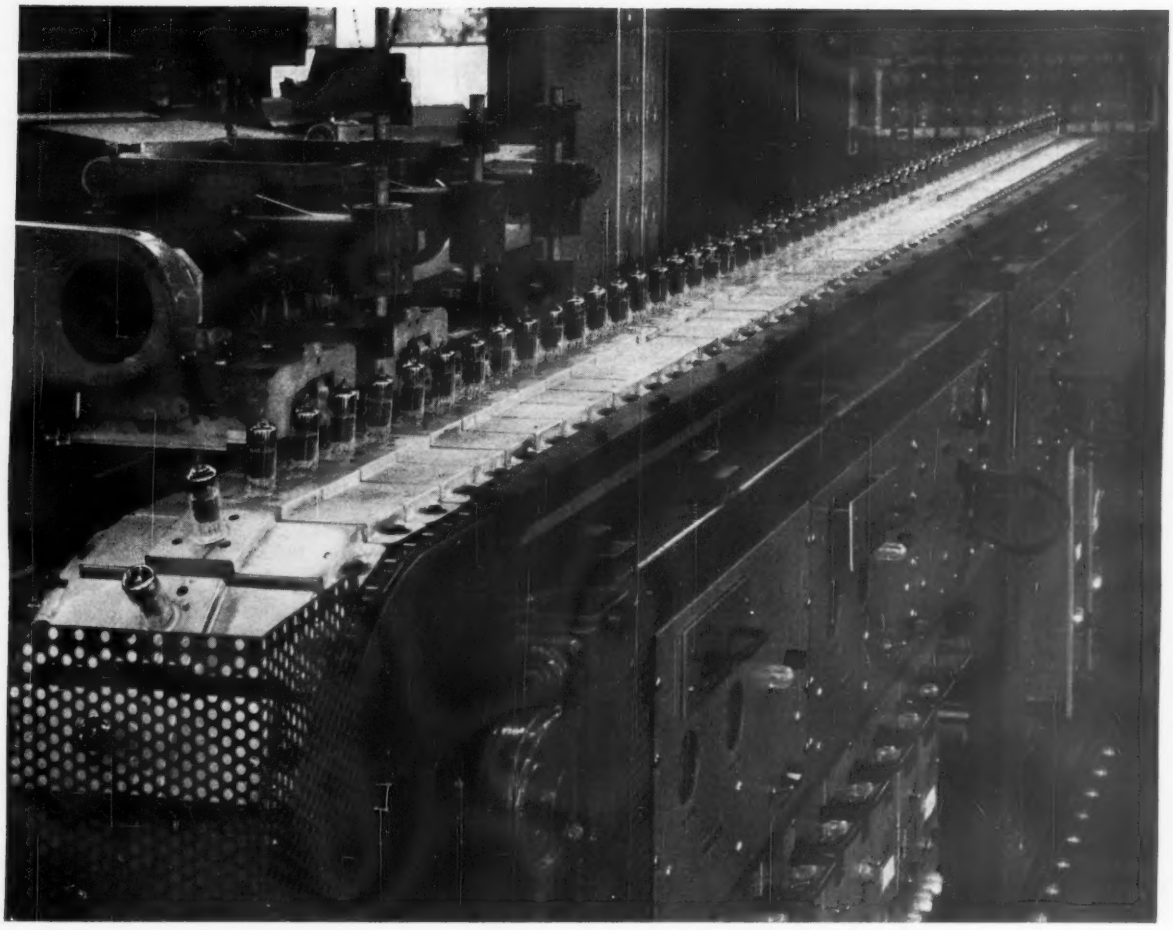
Further, all production is divided arbitrarily into lots and random sampled. Lot division for high production items may be hourly; for low production, lots may involve a run of one or more days.

Each lot sample is inserted into racks for "life" tests—100 hours is normal for most commercial items although 1000 hours is standard for critical parts employed in missile and rocket devices. If a given lot sample fails to pass, the entire lot is rejected and inspected 100 per cent for the characteristic that failed.

• During the life tests, batches of tubes are periodically routed through a Sylvania device that automatically produces a punched tape of test results.

The electronic test set measures and records the characteristics of each tube (on tape) in less than 2 seconds. The operator can also see the tape and make pencil notations to mark the beginning of a new series of tubes.

Batches of tubes are inserted in a preheat board in the automatic tester. The operator plugs in two



Lot samples are selected from this final inspection machine

preheated tubes. While one is heating, the other is tested for short circuits, open connections, gas, cathode emission, heater current, transconductance, gain, noise, and other characteristics.

As a tube is removed for return to the life tester, the device automatically switches the test contacts to the other tube. Sequence, characteristics, and values are adjustable. (The adjustments are made on the IBM board.)

• The computer quickly analyzes test results, comparing them with the initial values of each tube type. The analysis is presented in a way that enables production engineers to quickly isolate and correct potential trouble areas.

As the tape is put through the computer, it is programed for the same tube type. The computer selects the proper information and compares it with stored historical information and indicates whether the lot being checked is acceptable. The computer calculates the results of each test, indicating the average mean and standard deviation. Data are typed automatically, showing the results in summary form.

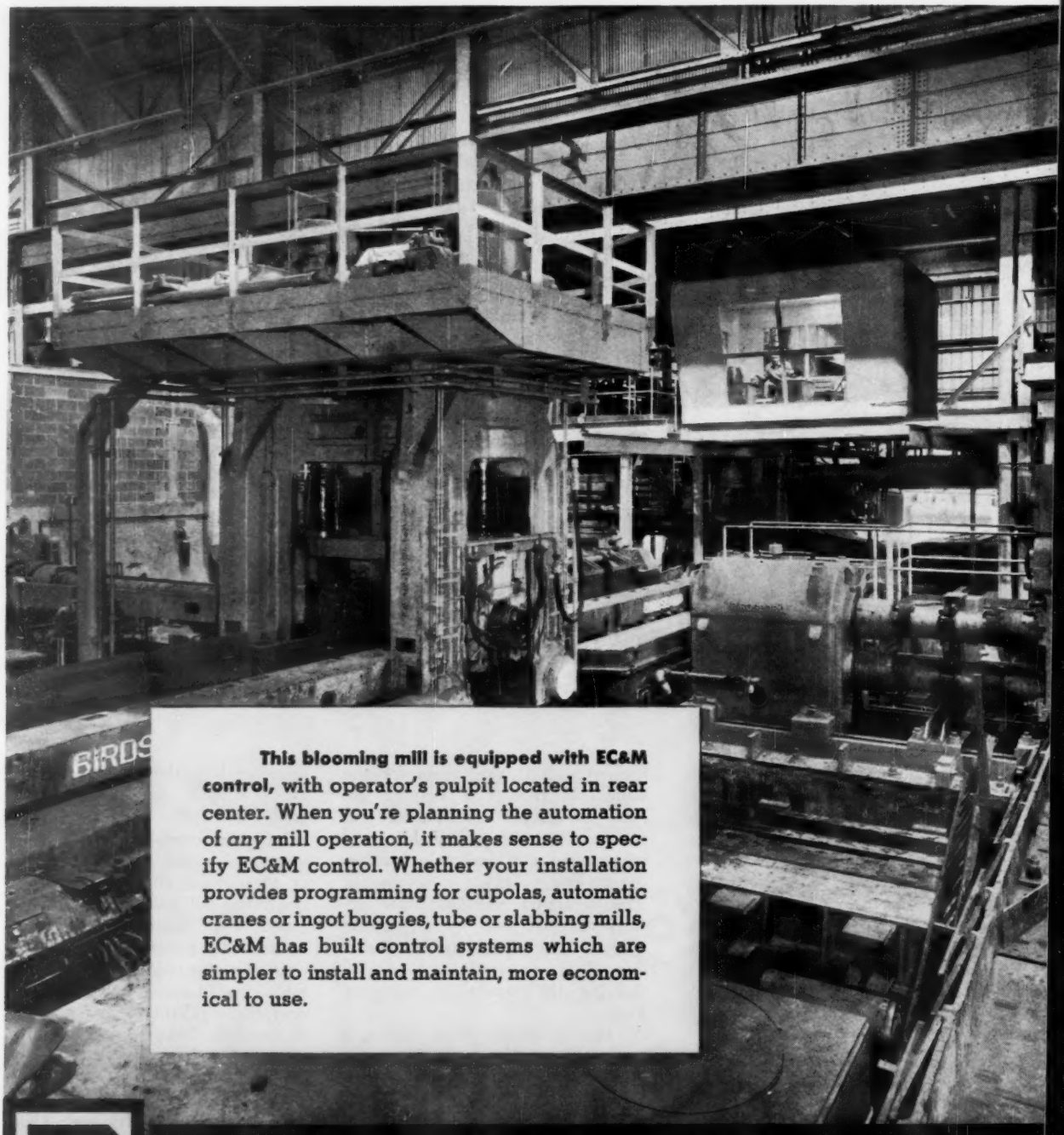
"The procedure takes about 2 hours instead of an entire day," says Herb Ehlers, plant manager at Emporium, Pa. "Human errors of judgment are eliminated, making the procedure far more accurate and reliable. So you can make changes faster and get problems corrected more quickly."

Here is an example he cites to illustrate how the system operates: "Let's suppose the operators suddenly notice that transconductance values on a series of tubes are creeping up. It's not enough to reject or to indicate any out of control condition, but let's say it shows a trend. When management sees that in the daily printed sheet from the computer, our engineers can be put into action immediately, testing each operation until they locate the cause of the shift. They are able to ward off trouble long before it causes tube rejections."

Sylvania still has plans for improving its system. Its goal: Completely automatic tube testing.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

Complete Mill Automation is Simpler,



This blooming mill is equipped with EC&M control, with operator's pulpit located in rear center. When you're planning the automation of *any* mill operation, it makes sense to specify EC&M control. Whether your installation provides programming for cupolas, automatic cranes or ingot buggies, tube or slabbing mills, EC&M has built control systems which are simpler to install and maintain, more economical to use.

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28, OHIO

Less Expensive with EC&M Control

Minimum set-up time saves many man-hours of work. Each EC&M system is thoroughly engineered, tested and adjusted at the factory.

Accuracy and reliability make your production job easier and more profitable. Heavy-duty mill-type components are used throughout. In addition, Square D's new Norpak static control is widely used in EC&M systems for virtually maintenance-free operation.

Simple operation means that new operators can be trained quickly. For instance, EC&M automatic screwdown systems are equipped with easy-to-use push button controls, and programming is available by either punched cards or slider panels. Direct reading eliminates coding and de-coding, and there are no schedules to memorize.

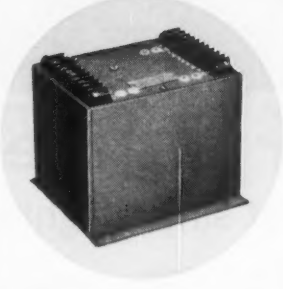
Systems for any job are built to fit your exact requirements, including new reactor control for stepless hoist installations. EC&M engineers are trained mill specialists who design, engineer and build the automatic control system that's best for *your* job.

• • •

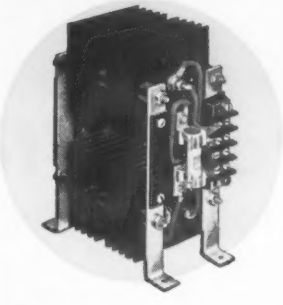
Write for detailed information or contact your local Square D field office for details on EC&M automated mill control systems. Square D Company, EC&M Division, 4500 Lee Road, Cleveland 28, Ohio.

QUALITY COMPONENTS MAKE EC&M SYSTEMS DEPENDABLE

NORPAK,
Square D's new static control, adds extra reliability to EC&M systems. Transistorized NOR units are compact and sealed in Epoxy to keep out foreign matter and moisture. All external connections are positively made by locked-in tapered pin construction.



MAGNETIC AMPLIFIER
is frequently used in place of conventional thyratron and rotating amplifiers. Its rugged construction makes maintenance almost nonexistent. Unlike tube-type amplifiers, magnetic amplifiers are not harmed by vibration, will give top performance indefinitely.

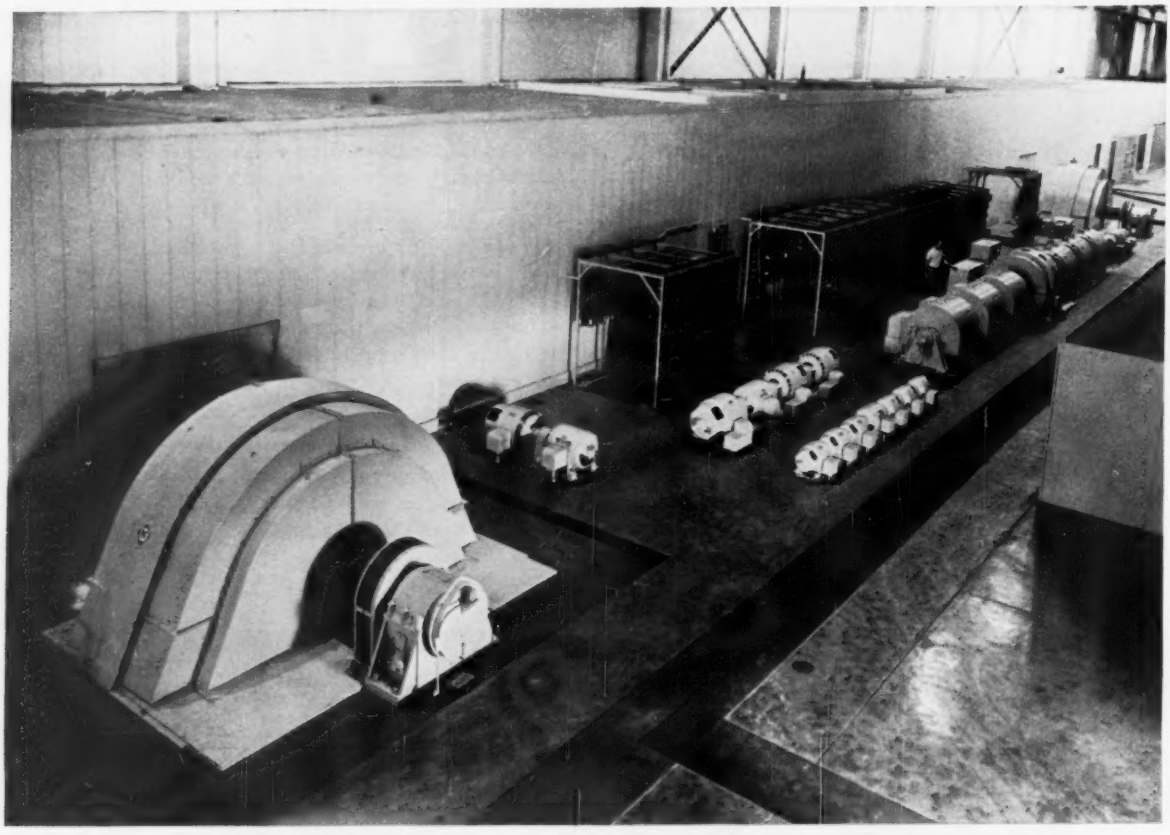


SILICON-CONTROLLED RECTIFIER
combines extremely high gain with very fast response. Like the grid in a thyratron tube, a silicon-controlled rectifier passes current only when a signal is applied. As used in EC&M systems, they provide a high-power output directly to a load.

wherever electricity is distributed and controlled

4530-R

ALLIS-CHALMERS



Power for Kaiser Steel

Allis-Chalmers powers hot strip roughing train at Fontana

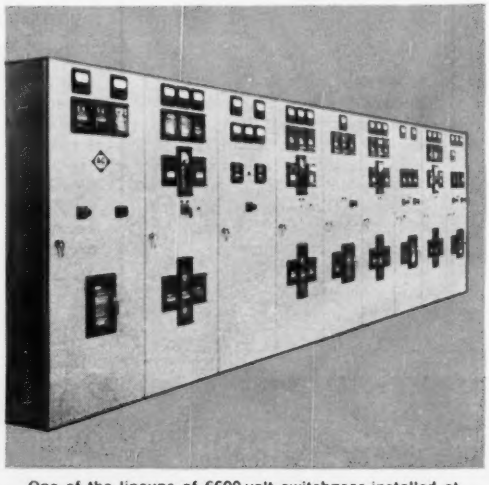
Steel companies look to Allis-Chalmers for leadership in powering hot strip mills. Reason? *Experience.* During the past 10 years, A-C has upgraded numerous finishing trains and has powered most of the roughing trains installed in this country.

Allis-Chalmers roughing train equipment at Fontana includes 6600-volt switchgear, four 6000-hp synchronous motors, one 5000-hp wound-rotor motor and one 3000-hp synchronous motor. Variable voltage control for edgers and slab squeezers was also provided, along with supporting variable voltage motor-generator sets, and dynamic braking and inching equipment.

In addition to equipment for steel mills — motors, control, switchgear, transformers, rectifiers, compressors, steam turbines, pumps — Allis-Chalmers will undertake responsibility for designing complete operating facilities. This *Systemation* service is based on processing knowledge gained as a major supplier of power equipment plus electronic control system experience gained through Consolidated Systems Corporation, an affiliate company.

For information on Allis-Chalmers power*full leadership, contact your A-C representative or write,* **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wisconsin.* A-1418

Systemation is an Allis-Chalmers servicemark.



One of the lineups of 6600-volt switchgear installed at Kaiser's Fontana Works.

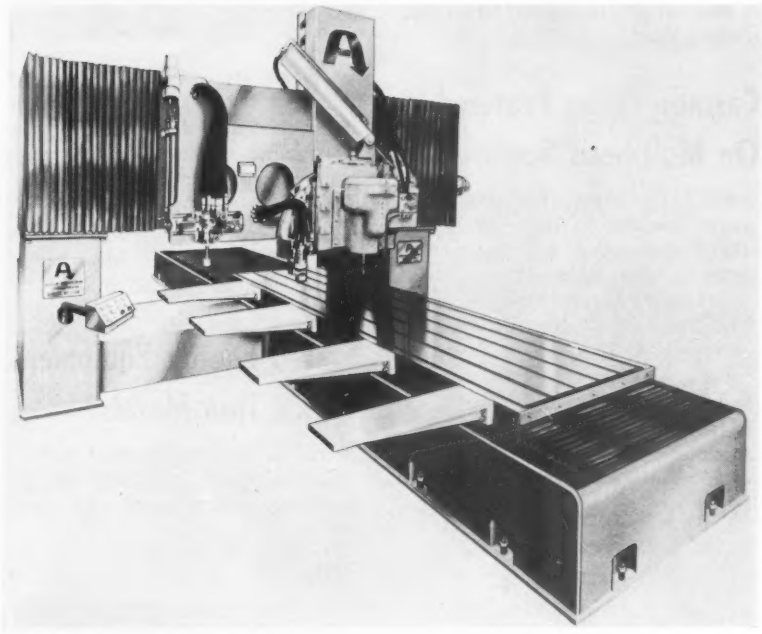
Twist Profiler Accurate on High Production Work

ACCURATE, high production machining of irregular twist contours is possible with the Model P-412 twist profiler. A minimum amount of skill is required, says the manufacturer.

The machine is capable of performing any 360 degree profiling, three dimensional operation, and swarf or twist contour machining. Operation is simple: The operator traces around a template with the stylus and the cutter accurately duplicates the movement on the workpiece.

The unit is powered to machine steel, titanium, and aluminum. Tolerances are held within 0.005 in. Direction of movement is controlled hydraulically (actuated by a True Trace valve.) The unit is designed for adaptation to tape control.

For further information, *write* Arrow Engineering Co. Inc., Largo, Fla.



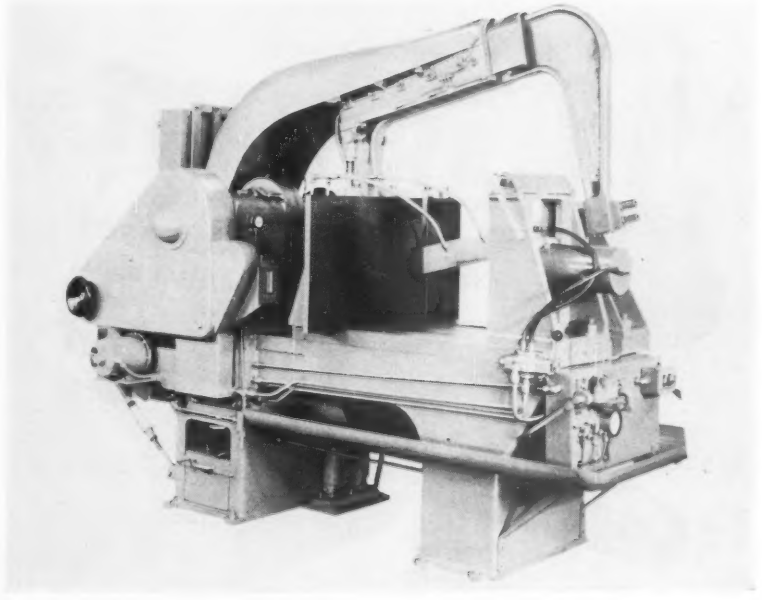
Saw Cuts 24 in. Squares of High Density Alloys

HIGH DENSITY alloys and metals such as titanium, Hastalloys, beryllium, or zirconium can be cut with a heavy duty hydraulic saw (Model 2424). It can cut material up to 24 x 24 in. square and 25 in. in diameter. The saw blade measures 36 x 4½ x 0.125 in. x 2T.

A 10 hp, four speed Lima motor and a built-in, three speed gearbox provides 11 variables in speeds ranging from 12 to 145 strokes a minute. Stroke length is 6 in. The unit has an adjustable pressure type hydraulic feed with a range from 0 to 350 psi.

A total downward pressure of about 4200 psi can be applied with the double main cylinders. A heavy duty, hydraulic chuck cylinder (adjustable vertically) holds the workpiece.

Height from floor to table top is 32 in. The unit can be set up to



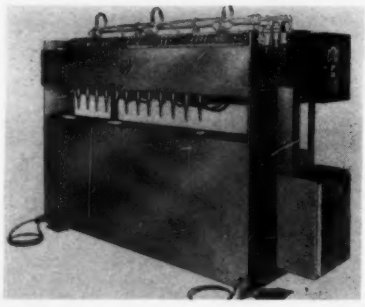
produce 12, 17, 22, 25, 35, 50, 65, 85, 90, 105, and 145 strokes a minute. Floor space requirements for the saw are 51 x 112 in. The unit weighs 6900 lb.

For further information, *write* Machinery Div., Racine Hydraulics & Machinery Inc., 2000 Albert St., Racine, Wis.

Cascade Firing Featured On Multihead Spotwelder

CASCADE firing prevents high power demand on the Alphil multihead spotwelder. All heads come down at the same time and the transformers fire one after the other. The setup is available as a standard unit with 4, 8, or 12 heads.

Each head has its own cylinder and is individually adjustable. Each head also has its own shutoff valve. A timer and an on-off switch for each transformer allows the use of all or any combination of heads.



Other features include a squeeze and hold timer (to insure positive and consistent welds) and two stage foot switch. Simple adjustments help reduce setup time to a minimum.

For further information, *write* Alphil Spot Welder Mfg. Corp., 1058 Pacific St., Brooklyn 38, N. Y.

Stored Energy Equipment Welds Thin Metals

A LINE of stored energy welding equipment is set up to meet needs of manufacturers of parts such as relays, tubes, tranducers, pots, thermocouples, and high density component packages. The complete line includes six different stored energy power supplies and five different weld heads and handpieces.

The welding power supplies include ultrashort discharge time, fully metered controls, input voltage regulation, and a packaging concept that allows all units to be used on standard production benches without special installations.

The company says weld heads feature the lowest possible inertia to insure quick followthrough on welds.

For further information, *write* Marketing Dept., Vacuum Tube Products Div., Hughes Aircraft Co., 2020 Short St., Oceanside, Calif.

Portable Grinding Unit Equipped with Air Motor

A LIGHTWEIGHT, portable grinding unit can handle a variety of grinding, machining, and boring jobs in difficult spots that can't be reached with ordinary equipment.

The developers of the unit claim that the grinder has eliminated loss in production time, expensive replacement costs, and idle work hours in field trials. The unit (called GIG) can be taken to the machine, and the work can be performed in

one stop gift shop

all that's new in gleaming stainless steel in one exciting display

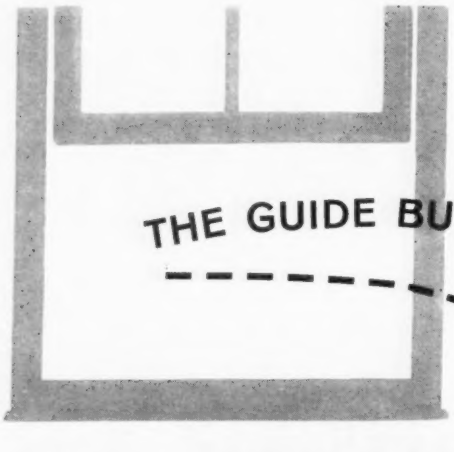
There's something new in your favorite store. It's the Stainless Steel Shop. The latest in gleaming Stainless kitchenware, tableware, utensils and appliances are all gathered in one place for easy, beautiful selection. Carefree Stainless Steel makes a welcome present for a friend and for yourself, too.

McLouth Steel Corporation
Detroit 17, Michigan

Look for the **STEELMARK** on the products you buy.

Stainless Steel

McLOUTH STAINLESS STEEL

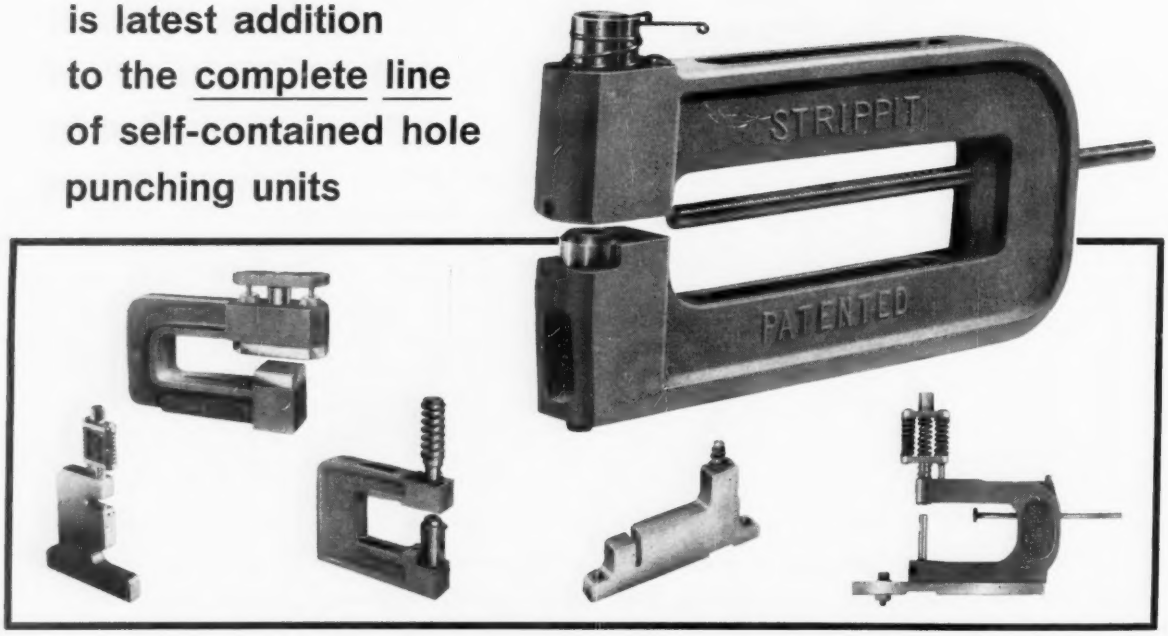


Wales STRIPPIT's new "BN" units have been designed for use *with or without* a guide button. Now, with this exclusive feature, only a punch and die (round or shaped) are required when you change from one hole size to another. For special applications and for optimum hole quality, the option of using a fitted or closed guide is still available.

THE GUIDE BUTTON GOES OUT THE WINDOW

NEW STRIPPIT "BN" SERIES

is latest addition to the complete line of self-contained hole punching units



Only STRIPPIT's "BN" units offer all these features:

- Use of fitted or closed guide button optional.
- All holders keyed for *both* round or shaped punches and dies.
- Self-storing keys supplied with each holder.
- Streamlined holder permits punching closer to leg of formed flanges and angles.
- New die section design permits easy removal and rotation of die without removing holder from set-up and retains the advantages and strength of one-piece construction.
- New threaded gage rod positions work more accurately and positively.
- All units, including ¾" unit, have hold-down slots for easier mounting.
- New stripping guide slips out quickly and easily without taking off retainer clip.
- One-piece oil hardened tool steel punches.
- Series expanded to include maximum hole size of 3½" in 10 gauge material.

WALES **STRIPPIT** INC.

A UNIT OF HOUDAILLE INDUSTRIES, INC.

210 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario
In Continental Europe: Raskin S. A., Lausanne, Switzerland *In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England*

place. In most instances, dismantling of the equipment is not necessary. The air operated unit weighs 37 lb and can be operated by one man.

The GIG is driven by a variable speed, high torque, air motor. A smaller air motor, operating on adjustable eccentrics, rotates the grinder spindle assembly in circles offset up to 1½ in. in diameter with reference to the center line of the grinder. The company says that makes use of a lathe compound for collector ring and valve grinding and grooving unnecessary.

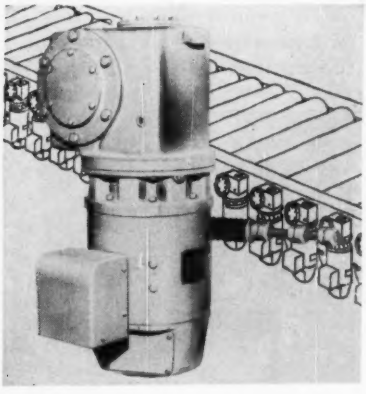
For further information, *write* Gilmore Industrial Grinders Inc., 6523 Eppes St., Houston, Tex.

Special Seals Protect Floating Gear Motors

FLOATING gear motors (Verti-Seal) for runout table and heavy duty conveyor applications are available from Westinghouse in ratings from 1 to 15 hp.

Special seals prevent lubricating oil in the gear casings from leaking into the windings of the integral motors mounted below the gear units.

A single reduction, worm gearing with a hollow, low speed shaft fits over the driven shaft and is keyed to it. A bracket on the gear case or on the motor connects a spring loaded torque arm to the table to oppose reaction torque. The arm permits the gear motor to float on the driven shaft and minimize possible roll neck eccentricity and reduce shock caused by intermittent loadings.



The company says the drives effect up to 60 per cent savings in aisle space because the hollow, low speed shaft permits the unit to be mounted directly on the driven shaft.

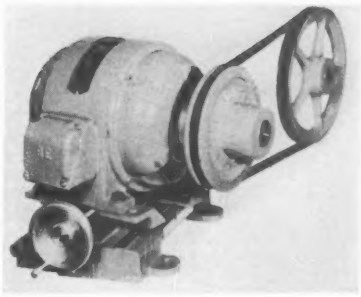
For further information, *write* Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Adjustable Motor Bases Can Be Used on Angle

ADJUSTABLE motor bases MB-11 and MB-12 may be used with such spring loaded sheaves as the Speed Selector standard M type to provide a complete drive for low speed applications from ¾ to 10 hp.

A simple handwheel control is provided for speed variation. A remote control can be obtained. The speed indicator and comparator scale facilitate setting the drive at any desired speed. The screw type control is self-locking.

The motor bases can be used in angular position to help maintain



proper belt alignment and assure longer belt life.

For further information, *write* Speed Selector Inc., P. O. Box 312, Chagrin Falls, Ohio.

Unit Reclaims Oils From Chips and Turnings

COOLANT and cutting oil costs can be reduced by running metal chips and turnings through the Olson chip wringer. The company says that even after long periods of draining in a settling tank, metal chips or turnings still contain as

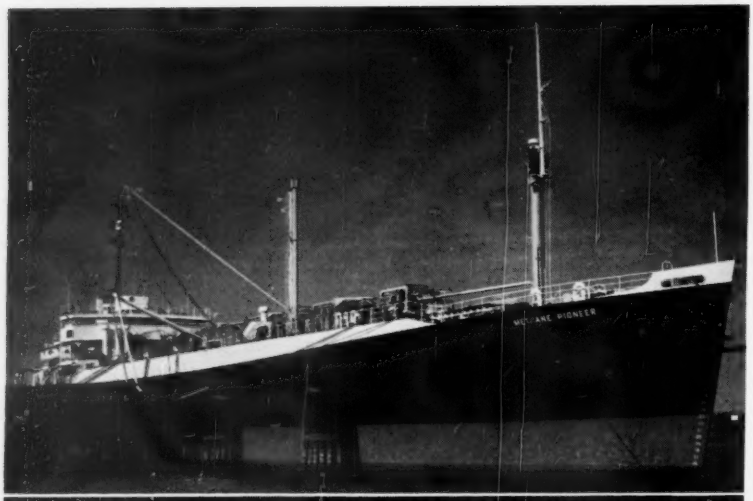
RUGGED
OHIO Magnets

Rugged, powerful and cool-operating for bigger all-day loads. Brawny and tough to stand the gaff in roughest service. Specify Ohio Magnets. There's a type to solve every magnetic handling problem.

Contact your nearest Ohio representative for magnetic materials handling recommendations, or write for Bulletin 112B. A-3744A

ohio ELECTRIC
THE OHIO ELECTRIC MFG. CO.
5400 Dunham Road
Maple Heights, Ohio.

Subsidiary of HOWELL ELECTRIC MOTORS COMPANY



Job report courtesy of Conch Methane Co., Ltd.

when pipe joints must be completely dependable at minus 258°F

The engineers who successfully "broke through" the problem of handling liquefied methane gas on and off the "METHANE PIONEER" at minus 258°F had to "play it safe" in every respect. To provide unquestionably *safe* stainless pipe joints, Arcos EB Consumable Weld Inserts were used to make the important root passes.

EB Inserts permit welding to be done from one side only. They eliminate back-up ring obstruction and produce a smooth inside contour to expedite gas flow. If you are not familiar with the advantages of EB Weld Insert for "tough" pipe joining problems, write ARCOS.

*Trademark of General Dynamics Corp.

WELD WITH ARCOS

EB* WELD INSERT

ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

NEW PRODUCTS and equipment

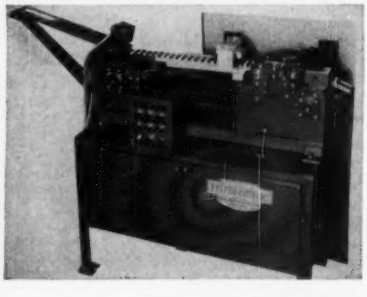
much as 2½ to 3 gal. of oil per 100 pounds. By running chips for not more than three minutes in the unit, at least 90 per cent and as much as 99 per cent of the oil remaining can be removed.

For further information, *write* Olson Filtration Engineers, 5024 Section Ave., Cincinnati 12, Ohio.

Machine Soft Solders 3000 Parts an Hour

THE ENDS of caps are soft soldered to fuse links at the rate of 3000 fuses an hour on the Ther-Monic machine. The operator places the link in the casing, then loads the casing with gypsum. A soft solder washer is placed in each end of the caps. (The washers are a 50-50 sandwich type and contain flux.) The caps are placed on each end of the casing and a link is bent over as the cap is slipped onto each end. That makes a 180 degree bend so the link will solder to the ID of the cap as well as the bottom.

The assembled parts are placed on an inclined plane magazine. An escapement feeds the parts onto a straight line, moving conveyor, and



the soft soldering process begins. The completed parts pass through a sizing device to insure that the cap is pushed snugly up to the link, displacing the molded solder and making 100 per cent contact with the cap. In addition, the fuses are automatically checked for continuity before they leave the conveyor. Rejected fuses are pushed off into a tote box.

For further information, *write* Induction Heating Corp., 183 Wythe Ave., Brooklyn 11, N. Y.

Wire and Cable Tester Has Wide Temperature Range

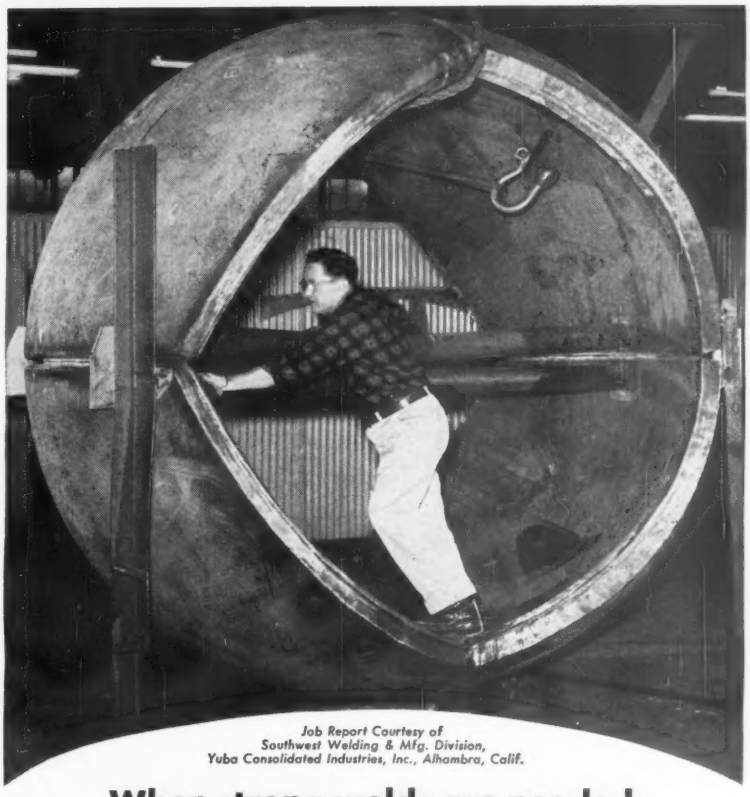
WIRE and cable can be tested under varying temperature conditions from 80 to $-100°$ F ($\pm 2°$ F) with the aid of a unit designated WU-100-24. Pulldown takes 60 minutes.

The chamber of the unit is 24 in. wide, 26 in. deep, and 72 in. high. It's penetrated by a self-supporting, cone step mandrel which provides for testing on 2, 3, 4½, and 6 in. diameters. It may be used on the side or back wall of the chamber.

For further information, *write* Cincinnati Sub Zero Products, 3932 Reading Rd., Cincinnati 29, Ohio.

Sensitive Unit Machines Irregularly Shaped Parts

A THREE station Transfer-matic holds flywheel housing and transmission extension mounting faces parallel and flat within 0.003 in. total indicated runout (TIR) and



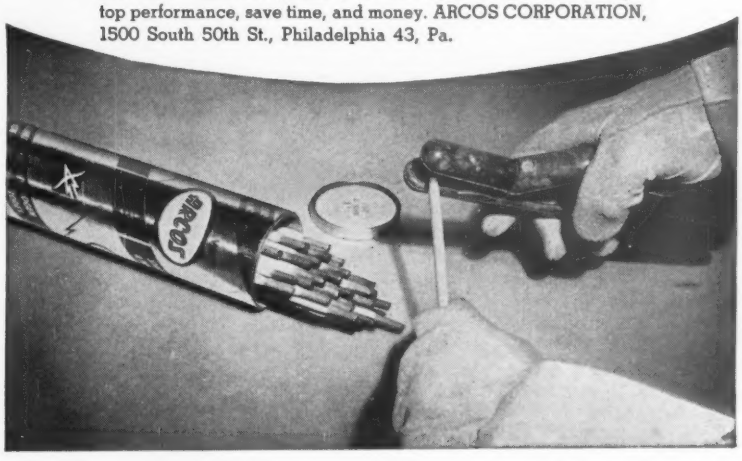
Job Report Courtesy of
Southwest Welding & Mfg. Division,
Yuba Consolidated Industries, Inc., Alhambra, Calif.

When strong welds are needed to resist impact at minus 320°F

WELD WITH ARCOS

STAINLESS ELECTRODES

This six-section spherical liquid oxygen container is made of Type 321 stainless steel. Walls 4½" thick were required to withstand 3000 psi pressure. To assure crack-free welds to meet ASME impact properties at −320°F, it was welded with Arcos Chromend 19/9Cb-LC electrodes with controlled ferrite. The first time—and every time you use Arcos electrodes—you get top performance, save time, and money. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Pa.



square with the main bore within 0.0035 in. TIR on a 3½ in. radius. The specifications call for a surface finish of 175 microinches which must be maintained despite interrupted cuts on both ends.

Operation: Three transmission cases are placed in the loading station with the shifter rod holes down and the cover face to the left. A mechanism transfers the parts from the loading station to the machining station, three at a time. In the machining station, the headstock advances and positions the driving arbors inside the main bores of the transmission cases. The parts are positioned axially so that the dimension from the end face to the center line of the shifter hole is maintained.

The drive arbors expand in the main bores to clamp the parts, and the tailstock centers advance while the transfer bars lower away. The main drive motor starts the rotation of the drive spindles and the single point tools feed across the end faces. When the cuts are finished, the main drive spindles stop and the transmissions are positioned with the cover faces down. The arbors release the parts, the transfer bar raises, the arbor and the tailstock centers withdraw, and the parts are transferred to the unload station where they are automatically removed.

The company cites four reasons for accuracy: 1. The parts are rotated on the axis of the main bore. 2. The driving arbor precisely centers the part without distorting it. 3. The drive spindles have a balancing arrangement. 4. The variable speed drive provides a constant cutting speed as the diameter of the cut changes. The complete machine cycle is 67 seconds, giving production of about 130 cases an hour at 80 per cent efficiency.

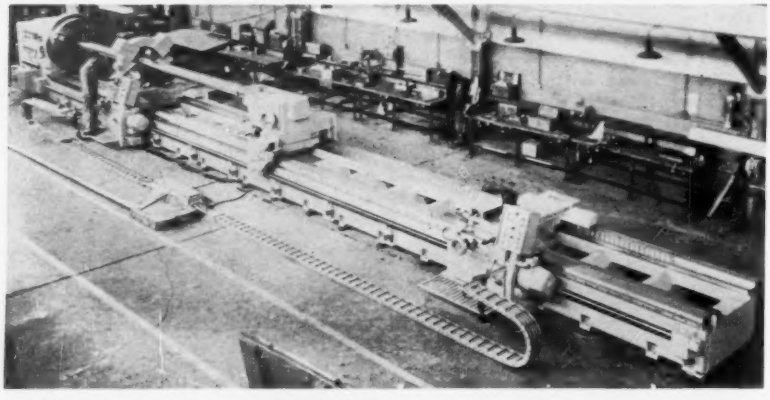
For further information, *write* Cross Co., Park Grove Station, Detroit 5, Mich.

Choice of Three Fuels Offered on Lift Trucks

THREE lift trucks, in 3000, 4000 and 5000 lb capacities, are designated F-30, F-40, and F-50.

The units are powered by gasoline, LP gas, or diesel fuel. The gasoline and LP gas engines develop a maximum of 52 hp.

For further information, *write* Engine-Material Handling Div., Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.



FOR U. S. STEEL CORP.'S HOMESTEAD, PA., PLANT, this 66 ft lathe can turn bars 50 ft long and 40 in. in diameter. Made of welded steel, it is shipped in two sections. Spindle speeds range from 12½ to 200 rpm. Face plate drive speeds range from 2 to 50 rpm. The headstock is equipped with a horsepower meter and electric speed indicator. Speed changes are set mechanically through two levers. Shifting gears are mounted on splineshafts. Longitudinal feed is infinitely variable from 0.0136 to 272 in. a minute. Cross feed is infinitely variable from 0.0136 to 54 in. a minute. For further information, **write** Clearing Div. of U. S. Industries Inc., 6499 W. 65th St., Chicago 38, Ill.

NEW literature

Write directly to the company for a copy

Holdback Clutch Catalog

Formsprag holdback clutches designed to prevent runback or reverse travel of inclined conveyors, bucket elevators, capstans, and related material handling or operating equipment are discussed in a 12 page catalog. Formsprag Co., 23601 Hoover Rd., Warren, Mich.

Magnesium Finishes

Such things as chemical cleaning, chemical dip conversion coating, electrochemical conversion coatings, plating, and organic vehicles for coating are covered in a booklet on "Finish Systems for Magnesium." Brooks & Perkins Inc., 1950 W. Fort St., Detroit 16, Mich.

Comparator Catalog

A 60 page book on optical comparators demonstrates how basic measuring is accomplished, provides details on accessories, and illustrates more than 20 applications, varying from tiny electronic components to large steam turbine blades. Jones & Lamson Machine Co., Springfield, Vt.

Gas Porosity

A four page bulletin discusses the problem of gas porosity in aluminum castings and lists the specifications of the Foseco Degaser. Foundry Services Inc., P. O. Box 8728, Cleveland 35, Ohio.

Air Cleaners

"Precipitron Electronic Air Cleaners for Oil Mist Control" (Catalog 1450) describes the characteristics of electronic air cleaners and tells how they can be applied to collect oil mists resulting from the operation of industrial machine tools. Sturtevant Div., Westinghouse Electric Corp., Damon Road, Boston 36, Mass.

NEW BOOKS

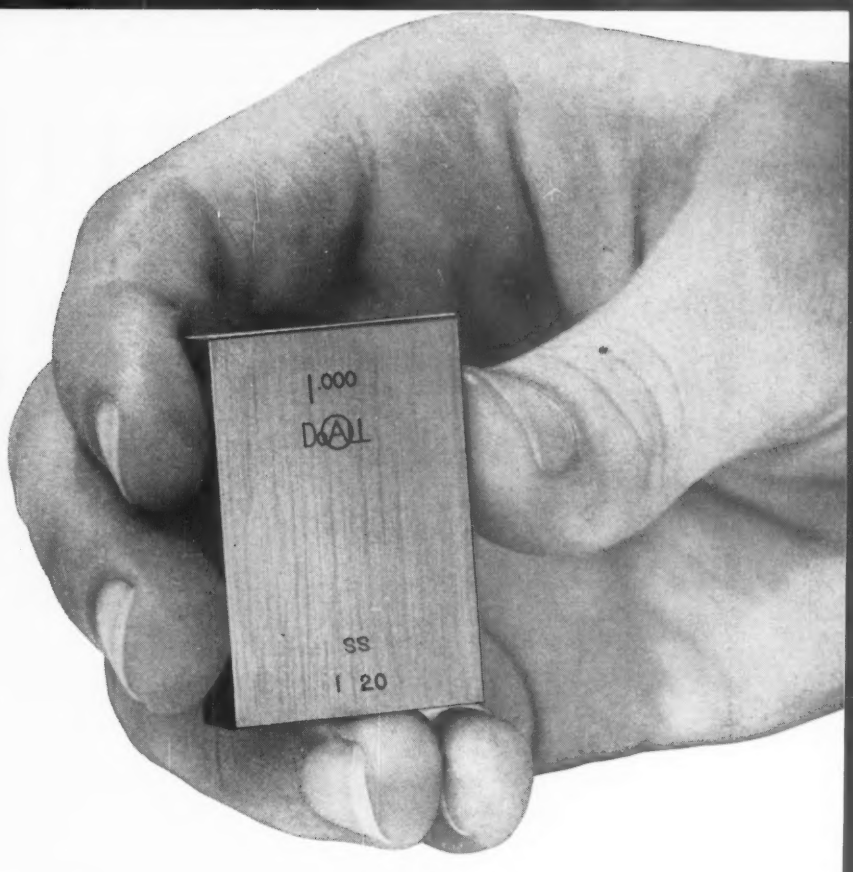
Work Improvement, Guy C. Close Jr., John Wiley & Sons Inc., 440 Park Ave. S., New York 16, N. Y., 388 pages, $7.75

Office, service, and industrial organizations get major attention. Covered are objectives, selecting and defining work problems, use of analytical tools, methods and techniques, and getting action on proposals.

Symposium on Applied Radiation and Radioisotope Test Methods, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 112 pages, $3.75

The symposium represents a concentrated effort to develop some proposed ASTM methods of analysis and testing involving the use of radioisotopes as analytical tools. Test methods are aimed at fulfilling the needs of specific industrial testing problems. Benefits of the radioisotope technique are stressed. Each written paper was developed as a proposed ASTM method.

DoALL tells how Lindberg equipment helps produce stainless steel gage blocks



For the DoALL Company, Des Plaines, Illinois, heat treatment of their Stainless Steel Gage Blocks was a most formidable problem. For lasting accuracy these blocks require extremely hard, wear-resistant surfaces, free from growth or shrinkage, as provided by nitrided stainless steel. Case depth must be controlled accurately and the core maintained at full toughness free of stresses. DoALL found the answer to this problem with a Lindberg Gas Fired Vertical Cyclone Tempering Furnace with a Nitriding Retort.

DoALL

Norman Silver, Chief Metallurgist, and Lindberg Vertical Tempering Furnace at DoALL Company.

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Lindberg provides the most complete line of heat treating furnaces, fuel fired or electric, large or small, for every heat treating requirement. Your Lindberg Field Representative (see your local classified directory) will be glad to consult with you on your heat treating requirements or write us direct. Heat Treating Furnace Division, Lindberg Engineering Company, 2441 West Hubbard Street, Chicago 12, Illinois.

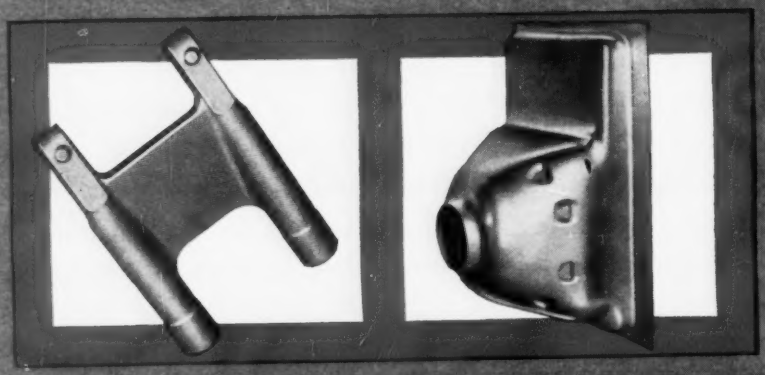
Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland and West Germany.

LINDBERG
heat for industry

FORGINGS

TRANSUE & WILLIAMS

STAMPINGS



From aircraft and missile forgings, to deep drawn stainless fat fryer tanks, are but a few examples of the wide range of the many components produced for all types of industry by T & W.

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in forgings: **Sizes:** 1 ounce to 500 pounds. **Materials:** Carbon and Alloy Steel, Non Ferrous and Stainless, Pure Molybdenum Titanium and High Temperature Alloys (Plain or Heat Treated).

in stampings: **Sizes:** 3 inches by 3 inches, to 60 inches long, 40 inches wide and 16 inches in drawn depth. **Materials:** Steel Stainless and Aluminum. (Blanking, forming, welding, sub and final assemblies).

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Steelmen Await Sunnier Days

STEELMAKERS are marking time until spring, hoping that better weather in March and April will give business a much needed lift. When winter storms abate, there will be more activity in the steel industry's two biggest markets—automotive and construction.

Until then, the sales trend will probably continue sidewise. Business is somewhat better in a few products than it was two or three weeks ago, but there's no over-all improvement in order volume. Most mills will book as much tonnage this month as they did in January, but only a few will sell more. In most cases, the companies that are doing better are heavily involved in production of pipe, oil country goods, or tin plate.

UPTREND IN PIPE— Demand for large diameter pipe is picking up at Midwestern and West Coast steel plants as gas transmission companies move ahead with expansion projects. Standard pipe sales are on the upswing because distributors are rebuilding their stocks in preparation for a spring pickup in construction. Oil country goods are selling better because major oil companies are running low on inventory. Even if the oil producers continue buying hand to mouth and don't step up their drilling, they'll have to order more tubing, casing, and drill pipe this year than they did in 1960. Reason: They lived off their inventories to a considerable extent last year.

TIN PLATE SHINES— Other than pipe, the only product that's showing much improvement is tin plate. Canmakers are taking bigger shipments as they step up production of containers that will be needed for spring food packs. Electrolytic tinning lines at some mills are believed to be running at 65 to 70 per cent of capacity—well above the average rate for other steel products.

OPTIMISM FADES— In spite of the favorable trends, steelmakers expect only moderate gains in March. Reason: Products which account for the great bulk of the industry's output—cold rolled and hot rolled sheets—are relatively weak. They've been hurt repeatedly by production cutbacks in the automotive and appliance industries. Last month, the automakers pushed some January tonnage into February and February tonnage into March. Now they're asking the mills to hold some March orders until April.

SCHEDULES REVISED— After turning out 414,498 cars in January, the automakers figured on building about 430,000 this month. Because of disappointing sales (partly attributable to bad weather) and big dealer inventories, they've trimmed their February output to an estimated 380,000 cars. The feeling in Detroit is that they'll boost production back to 480,000 in March. Because there are so many makes and models on the market today—89 models of the ten compact cars alone—automakers believe that they must keep inventories at the 1-million-car level to assure buyers an adequate selection.

BUYERS TELL PLANS— Second quarter steel orders will be "up slightly" from those of the first three months, predicts the steel committee of the National Association of Purchasing Agents. In its February report, the committee says 93 per cent of the steel buyers expect no change in product availability during the second quarter. Only 7 per cent believe inventories will increase.

STEELMAKING GAINS— Ingot output in the week ended Feb. 25 will probably be close to the 1,540,000 tons that STEEL estimates the industry produced in the week ended Feb. 18. (Output then was the highest thus far this year, up 1.1 per cent from the 1,524,000 tons poured in the week ended Feb. 11.)

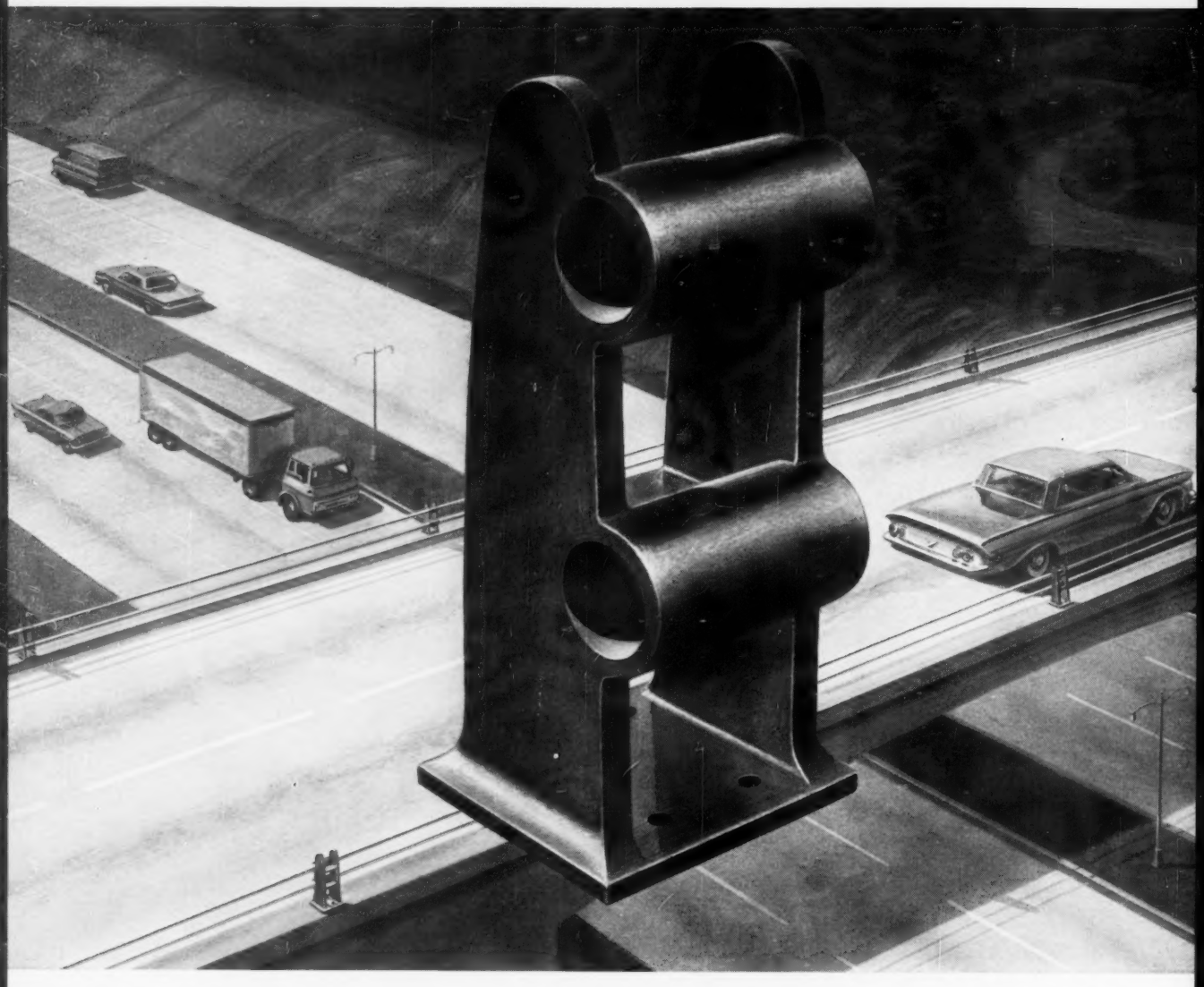
WHERE TO FIND MARKETS & PRICES

	News	Prices
Bars, Merchant	116	98
Reinforcing	96	99
Boiler Tubes	...	103
Canada	109	106
Charts:		
Finished Steel	...	97
Ingot Rate	96	...
Scrap Prices	...	109
Clad Steel	...	104
Coal Chemicals	...	106
Coke	109	106
Comparisons	...	97
Contracts Placed	117	...
Contracts Pend.	117	...
Electrodes	...	*
Fasteners	...	103
Ferroalloys	...	*
Fluorspar	...	106
Footnotes	...	103
Imported Steel	...	106
Ingot Production	96	...
Metal Powder	...	106
Nonferrous Met.	112	114
Ores	...	106

	News	Prices
Pig Iron	109	105
Piling	...	98
Plates	116	98
Plating Material	...	115
Prestressed Strand	...	103
Price Indexes	...	97
Producers' Key	99	...
R.R. Materials	115	103
Refractories	...	106
Scrap	108	110
Semifinished	...	98
Service Centers	93	105
Sheets	94	99
Silicon Steel	...	100
Stainless Steel	...	104
Steel Shipments	115	...
Strip	94	100
Structurals	117	98
Tin Mill Prod.	115	100
Tool Steel	...	104
Tubular Goods	109	104
Wire	95	100

*Current prices were published in the Feb. 13 issue and will appear in subsequent issues.

How the Foundry Industry Serves America . . . #13 of a Series



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A higher standard of safety at a substantial saving in price has been achieved through the use of malleable iron bridge railing posts on the Connecticut Thruway.

Chosen over a fabricated component for its superior impact resistance and its strength to meet rigid safety requirements, the malleable iron supports saved the Highway Department approximately 13% on the cost of the units previously used. A saving in future maintenance is also assured through malleable iron's ability to retain a smooth finish against the corrosive effects of salt air.

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Facts from the files of Malleable Founders Society

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Service Centers Now Moving More Steel

STEEL is moving a little faster into consumption through the nation's service centers, generating hopes that reversal of the business downtrend may be starting.

Some distributors' sales in January were up 10 to 15 per cent over December's volume, and performance so far in February holds out the promise of a slow, steady rise in activity throughout the first quarter. The second quarter is expected to see a noticeably sharper demand spurt.

• **Necessity Buying**—Part of the upswing early this year may be attributable to purchasing that had been delayed from December because of yearend inventory taxes. But a substantial portion of new orders is believed due to necessity buying arising from the depleted inventories of many metalworking plants.

Any upturn in buying is encouraging in the present sluggish market. It's especially welcomed by service center operators who've been severely pinched by lagging demand and sagging prices over recent months. Increased order volume, operators hope, will quickly exert a steadying influence in a marketing situation that, through most of 1960, served to foment price cutting and uneconomic selling practices.

Industry leaders claim that "price fighting" has squeezed profits so severely, the financial integrity of some distributors will be undermined unless market stability is soon attained. Service center gross profit margins—the spread between buying and selling prices—reportedly have been cut about 25 per cent over the last three years, at least 5 per cent of the contraction took place during 1960.

• **Earnings Shrink** — While there have been relatively few service center bankruptcies so far in the recession, the earnings of some distributing firms are reported on the verge of disappearing. Even the large nationwide chains report their earnings have dropped precariously close to the breakeven point. One chain warehouse operator's 1960 net income was down 62 per cent from that for 1959, although his dollar sales volume was off only about 10 per cent.

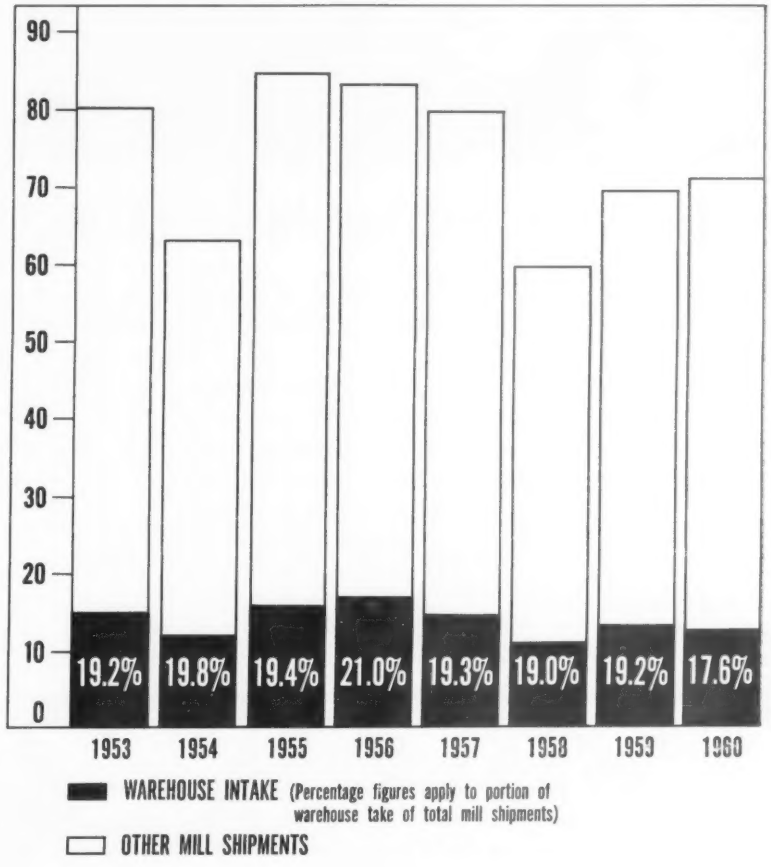
The mushy price situation in 1960 was attributed to high inventories held by both distributors and their customers. Smaller consumption and more than adequate supplies intensified competition. The scramble for orders was aggravated by large offerings of low priced imports and, to some extent, by direct competition from a few mills seeking small lot (distributor) tonnage.

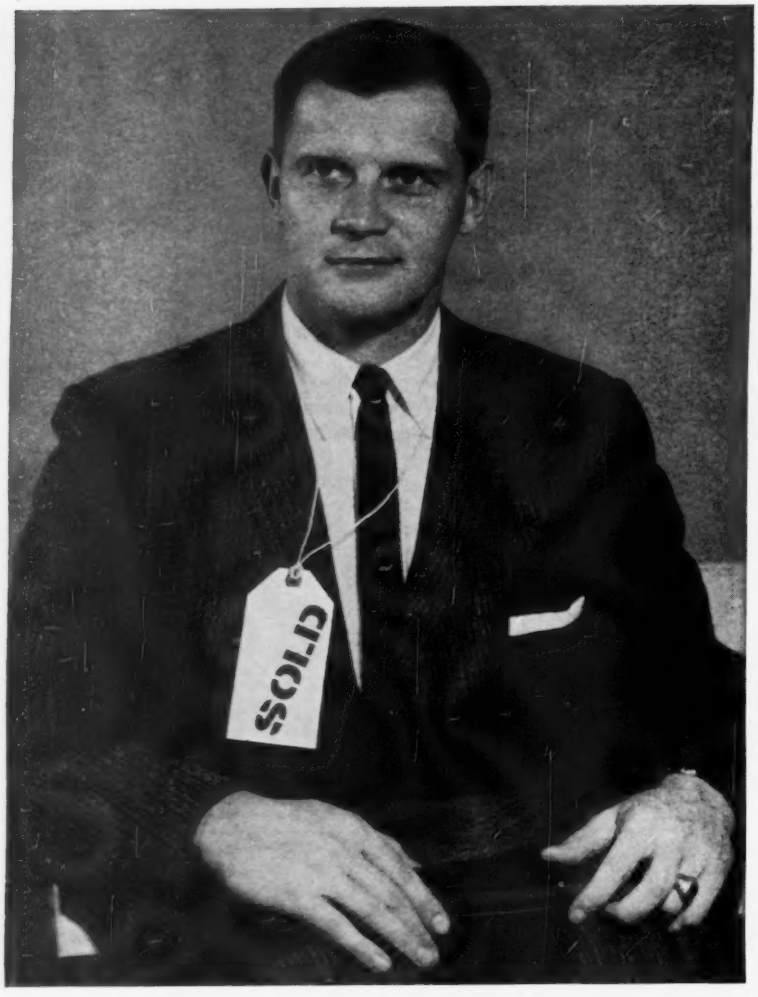
• **Inventories Corrected** — Right now, it looks like the inventory situation has been pretty well licked. Some service centers are still cutting stocks of slow moving items. They're seeking faster turnover (at least three times a year). Through better merchandising techniques, including use of electronic data processing, they hope to provide even better service to customers without overloading their inventories. At the same time, some distributors are seeking inventory balance and have started ordering a little more freely from the mills.

Service center stocks total about 3.1 million net tons. That's about 400,000 under normal, but it's 2 million tons greater than the total

Service Center Steel Intake Holds Steady

(Finished steel shipments—millions of net tons)





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FREE: Bulletin FY-179, *Mechanical Charging Systems.* Write Whiting Corporation, 15643 Lathrop Avenue, Harvey, Illinois. In Canada: Whiting Corporation (Canada) Ltd., 350 Alexander Street, Welland, Ontario, Canada.

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FOUNDRY EQUIPMENT

held at the start of 1960, just after the 116 day steel strike.

• **Hold Position**—The service centers hold second place in the ranking of steel mill market outlets. Their 1960 steel take was about 12.4 million tons, 17.6 per cent of total mill shipments. That's down about 4 per cent from 1959's take of 13 million. Over recent years, the distributors' intake has ranged from a low of 10.9 million in 1958 to a high of 16.7 million in 1956. Their percentage take of mill tonnage has held in a surprisingly narrow range, from a low of 17.6 to a high of 21 (see chart).

Today, the distributors play a more important role in the scheme of steel distribution than they did 25 or 30 years ago. Looking beyond 1961, trade leaders think metalworking shops will increasingly lean upon the service centers, being attracted by the cost saving advantages which the modern service center extends its customers in the way of large, well balanced stocks of a wide variety of products at all times, as well as extensive processing and fabricating services.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 99 & 100

On a day-to-day basis, February sheet order volume is holding at the January level, which was up a little from that in December. The trend is gradually upward, with more inquiries and orders coming in from miscellaneous users. Inventory liquidation is thought close to the end. Reason: More consumers are placing rush orders which seem to approximate their current needs.

As yet, there's no promise of a burst of ordering for March. However, some producers have booked some tonnage as far ahead as April and May. In general, except for auto requirements, demand is showing improvement over a wide area of general consumption.

There's better demand for sheets by makers of light drums. Also, more tonnage is moving to the manufacturers of office furniture and files. Some lines of appliances are specifying more freely. Appliance business is slow. Water heater business is active. One maker upped his sheet orders at one mill four times this month.

Hotpoint Div., General Electric Co., reports distributors' sales of kitchen and laundry equipment to dealers rose 2.5 per cent in January compared with the like 1960 month. Air conditioners, refrigerators, washers, waste disposers, and water heaters accounted for the major sales gains.

More hot and cold rolled sheets are going into tubing and conduit. Galvanized sheets are moving better for maintenance and repairs, and a little more tonnage is going into air conditioning equipment.

Specialties (electrical sheets and enameling stock) are moving at a fairly moderate rate, deliveries averaging three to four weeks. Hot rolled sheets are available in two weeks, cold rolled in two to four.

Low Japanese Bid Wins Army Barbed Wire Order

The U. S. Army Engineer Procurement Office, Chicago, has awarded a contract for 19,200 spools of Japanese barbed wire for delivery to Sharpe General Depot, U. S. Army, Lathrop, Calif.

The low bidder was a southern California firm, offering Japanese made wire at $8.54 a spool. The next low bid was by American Steel & Wire Div., U. S. Steel Corp., which offered wire to be made at Pittsburg, Calif., for $9.2316 a spool. The contract, which involves about 960 tons, is worth $163,968.

Congressman John F. Baldwin of California has asked President Kennedy to correct future situations of this kind by Presidential directive. He maintains that the Army and other military departments should not buy goods produced abroad.

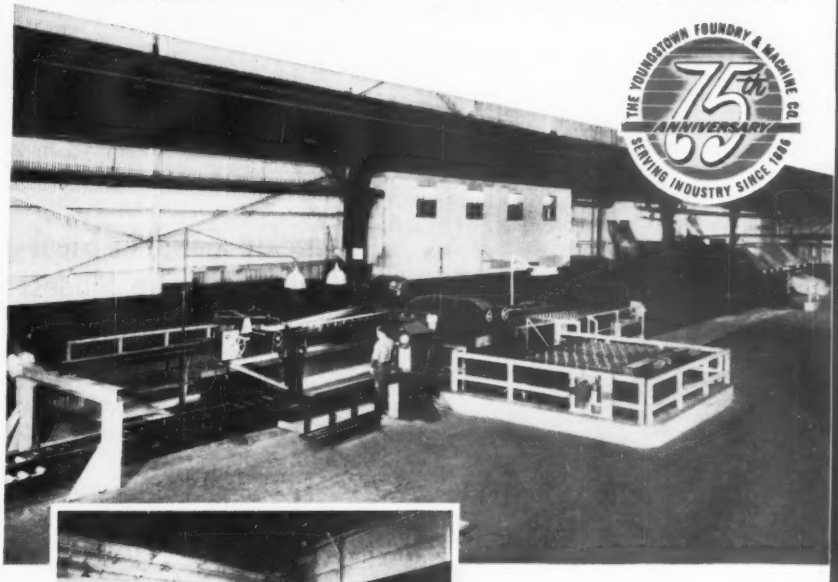
Wire . . .

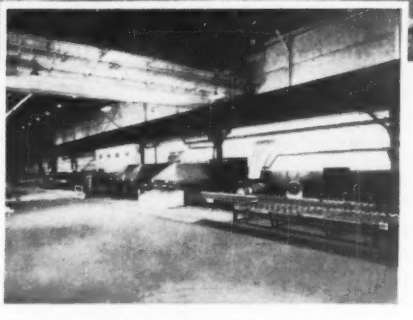
Wire Prices, Pages 100 & 103

Wire demand shows little change from that prevailing over recent weeks. Manufacturers' grades are in spotty demand at some points. Relatively little tonnage is moving on automotive account, including springs. The furniture makers are taking a little more tonnage than they were a month ago, but volume is not imposing.

Sellers of merchant wire products are expecting a pickup in ordering as spring nears. Whether this will bring out a heavy volume of orders

"YOUNGSTOWN"
81" SHEET SCRUBBER LINE





Entry end of "Youngstown" 81" sheet scrubber line at United States Steel's Irvin Works.

. . . built for

United States Steel's Irvin Works

Dravosburg, Pa.

This ultra modern 500 fpm scrubber line is designed to increase tonnage per turn, in cleaning steel sheets up to 76" wide and .250" thick.

The line was furnished complete including unloading conveyor, skew conveyor, acid spray unit, water spray unit, alkali spray unit, hydro scrubber unit, sheet dryer, cooling system and conveyors, and all auxiliary equipment including acid proportioning, dry met, fume exhaust system, electric motors and controls, air conditioned electrical control station, installation, erection, and foundation engineering.

You can rely on "Youngstown's" 75 years of scrubbing, pickling and cleaning know-how. Your inquiries are invited whether you require a complete turnkey installation or any auxiliary component.

The Youngstown Foundry & Machine Co.

Youngstown 1, Ohio

38

from distributors is uncertain because their stocks have been sufficiently large to permit prompt shipments in the recent past.

Steel Production Jumps 10 Per Cent in January

Steelmaking furnaces in the U. S. poured 6,424,000 net tons of ingots and steel for castings in January, about 10 per cent more than the 5,839,841 tons reported for December, 1960, reports the American Iron & Steel Institute. Output was the largest since last October when 6,868,380 tons were poured. In January, 1960, production totaled 12,049,404 tons.

The institute's index of steelmaking (1957-59 equals 100) in January was 77.9. The index for December was 70.8, that for January, 1960, 146.1.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 99

Demand for reinforcing steel is seasonally slow; in fact, it is not as good as it was a year ago. Bad weather is partially to blame.

Some reinforcing bar mills are operating around 60 per cent of capacity. Most are reported building backlogs for release when the building season opens. A large pending job involves 20,000 tons of bars for a missile project in Montana.

Midwestern fabricators of reinforcing bars and structurals are encouraged by the announcement that the Indiana State highway construction program will move into high gear. Some $45 million in federal aid funds is involved. The program, to be financed largely by federal funds released by President Kennedy two weeks ago, includes 29 miles of interstate highways and 28 miles of state highways, including 53 bridges.

Weekly Gains in Steel Output Remain Modest

STEEL estimates ingot production for the week ended Feb. 18 at 1,540,000 tons. That's an increase of 1.1 per cent over the previous week's total and represents the fourth consecutive weekly gain.

The outlook: Only minor fluctuations are expected over the balance of this month; a fair pickup is expected next month if weather conditions permit an increase in construction; and a significant rise in April is possible.

In most districts, no important change in output developed during the week ended Feb. 18. Here's the situation in various districts:

• **Chicago**—Production in the week ended Feb. 18 is expected to show a rise of about 5670 tons, but it represents a scheduling choice, not an improvement in steel orders. The average output rate for February is not likely to be any better than that for January. Optimism for a sizable improvement in March is evaporating rapidly. Reason: A worsening in demand for steel from automobile builders. Mills are receiving new pushbacks from March to April, and they represent fairly sizable tonnage.

• **Pittsburgh**—The steelmaking rate in this district gained in the week ended Feb. 18—due mainly to the relighting of two open hearths by Wheeling Steel Corp. Nine of the company's 11 furnaces are in operation. The over-all increase in the district's production for the week ended Feb. 18 is about 6100 tons.

• **Birmingham**—Production of steel ingots in this district rose about 6600 tons in the week ended Feb. 18, based on estimates by STEEL. Atlantic Steel Co., Atlanta, was expected to resume steelmaking operations following repairs to its blooming mill motor which had been flooded by an ice storm.

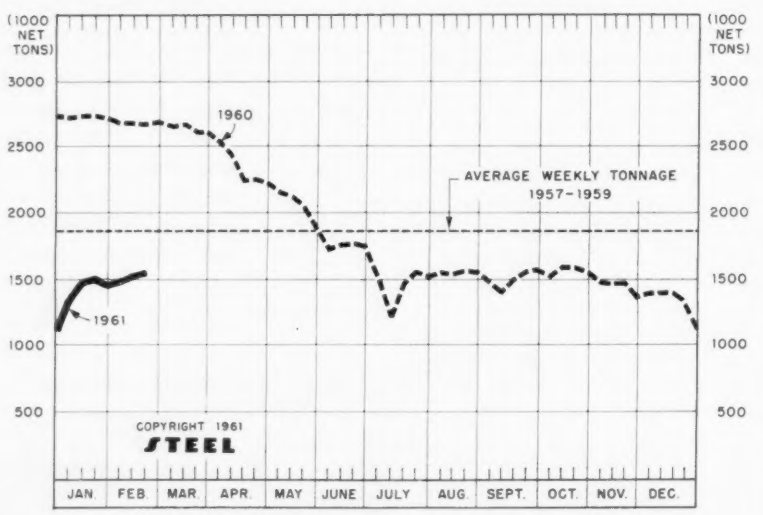
• **Cincinnati**—STEEL estimates production rose nearly 1600 tons here in the week ended Feb. 18. One mill is stepping up its output by 10 per cent, but its tonnage is relatively modest. Steelmen say the inventory of ingots is large at most mills, and many orders are being virtually custom rolled.

STEEL INGOT PRODUCTION

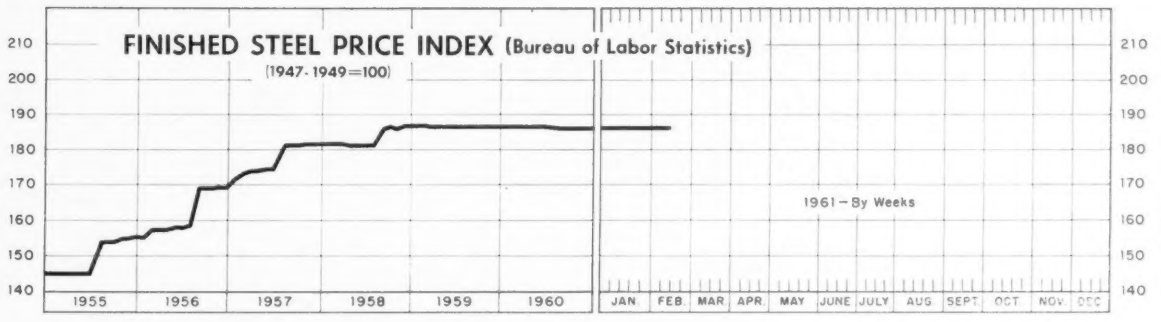
Weeks Ended	Net Tons	Change
Feb. 18	1,540,000*	+ 1.1%
Feb. 11	1,524,000	+ 2.1%
Feb. 4	1,492,000	+ 1.8%
Totals to Feb. 11		
1961	8,824,000	−45.7%
1960	16,256,000	

DISTRICTS	Week Ended Feb. 11 Tons‡	Index†	Week Ended Feb. 4 Index†
Northeastern	213,757	80	81
Buffalo	72,043	74	71
Pittsburgh	282,484	70	69
Youngstown	142,784	84	80
Cleveland	72,224	78	75
Detroit	90,229	86	93
Chicago	336,668	90	86
Cincinnati	64,094	85	86
St. Louis	52,025	99	86
Southern	81,297	75	78
Western	118,082	101	93
Industry	1,524,000	81.8	80.1

*Estimated by STEEL. †1957-59=100.
‡District tonnages are approximate and will not necessarily add to the national total.



Price Indexes and Composites



Feb. 14, 1961	Week Ago	Month Ago	Jan. Index	Year Ago
186.2	**186.2**	**186.2**	**186.2**	**186.8**

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Feb. 14

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.825	Bars, H.R., Carbon	6.675
Rails, Light, 40 lb	7.292	Bars, Reinforcing	6.335
Tie Plates	6.875	Bars, C.F., Carbon	10.710
Axles, Railway	10.175	Bars, C.F., Alloy	14.125
Wheels, Freight Car, 33 in. (per wheel)	62.000	Bars, C.F., Stainless, 302 (lb)	0.570
Plates, Carbon	6.350	Sheets, H.R., Carbon	6.350
Structural Shapes	6.167	Sheets, C.R., Carbon	7.300
Bars, Tool Steel, Carbon (lb)	0.560	Sheets, Galvanized	8.775
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.680	Sheets, C.R., Stainless, 302 (lb)	0.658
Bars, Tool Steel, H.R. Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.060 (lb)	1.400	Sheets, Electrical	12.625
Bars, Tool Steel, H.R. Alloys, High Speed, W18 Cr 4, V 1 (lb)	1.895	Strip, C.R., Carbon	9.489
Bars, H.R., Alloy	10.775	Strip, C.R., Stainless, 430 (lb)	0.480
Bars, H.R., Stainless, 303 (lb)	0.543	Strip, H.R., Carbon	6.250
		Pipe, Black, Buttweld (100 ft)	19.495
		Pipe, Galv., Buttweld (100 ft)	23.098
		Pipe, Line (100 ft)	195.430
		Casing, Oil Well, Carbon (100 ft)	201.080
		Casing, Oil Well, Alloy (100 ft)	315.213
		Tubes, Boiler (100 ft)	51.200
		Tubing, Mechanical, Carbon (100 ft)	27.005
		Tubing, Mechanical, Stainless, 304 (100 ft)	194.268
		Tin plate, Hot-dipped, 1.25 lb (95 lb base box)	10.100
		Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.800
		Black Plate, Canmaking Quality (95 lb base box)	7.900
		Wire, Drawn, Carbon	10.575
		Wire, Drawn, Stainless, 430 (lb)	0.665
		Bale Ties (Bundles)	7.647
		Nails, Wire, 8d Common	9.433
		Wire, Barbed (80-rod spool)	8.372
		Woven Wire Fence (20-rod roll)	20.910

STEEL's FINISHED STEEL PRICE INDEX

	Feb. 15 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	247.82	247.82	247.82	247.82	209.10
Index in cents per lb	6.713	6.713	6.713	6.713	5.665

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT	$149.96	$149.96	$149.96	$149.96	$127.91
No. 2 Fdry, Pig Iron, GT	66.49	66.49	66.49	66.49	58.99
Basic Pig Iron, GT	65.99	65.99	65.99	65.99	58.49
Malleable Pig Iron, GT	67.27	67.27	67.27	67.27	59.77
Steelmaking Scrap, GT	33.67	32.67	32.00	39.67	49.00

Comparison of Prices

Comparative prices by districts in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	Feb. 15 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.675	5.675	5.675	5.675	4.65
Bars, H.R., Chicago	5.675	5.675	5.675	5.675	4.65
Bars, H.R., deld., Philadelphia	5.97	5.97	5.97	5.975	4.90
Bars, C.R., Pittsburgh	7.65	7.65	7.65	7.65	6.25
Shapes, Std., Pittsburgh	5.50	5.50	5.50	5.50	4.60
Shapes, Std., Chicago	5.50	5.50	5.50	5.50	4.60
Shapes, deld., Philadelphia	5.745	5.745	5.745	5.77	4.88
Plates, Pittsburgh	5.30	5.30	5.30	5.30	4.50
Plates, Chicago	5.30	5.30	5.30	5.30	4.50
Plates, Coatesville, Pa.	5.30	5.30	5.30	5.30	4.80
Plates, Sparrows Point, Md.	5.30	5.30	5.30	5.30	4.50
Plates, Claymont, Del.	5.30	5.30	5.30	5.30	4.80
Sheets, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.325
Sheets, H.R., Chicago	5.10	5.10	5.10	5.10	4.325
Sheets, C.R., Pittsburgh	6.275	6.275	6.275	6.275	5.325
Sheets, C.R., Chicago	6.275	6.275	6.275	6.275	5.325
Sheets, C.R., Detroit	6.275	6.275	6.275	6.275	5.325-5.425
Sheets, Galv., Pittsburgh	6.875	6.875	6.875	6.875	5.85
Strip, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.325
Strip, H.R., Chicago	5.10	5.10	5.10	5.10	4.325
Strip, C.R., Pittsburgh	7.425	7.425	7.425	7.425	6.25
Strip, C.R., Chicago	7.425	7.425	7.425	7.425	6.25-6.35
Strip, C.R., Detroit	7.425	7.425	7.425	7.425	6.35
Wire, Basic, Pittsburgh	8.00	8.00	8.00	8.00	6.60
Nails, Wire, nonstock, Pitts.	8.95	8.95	8.95	8.95	7.60
Tin Plate (1.50 lb) box, Pitts.	$10.65	$10.65	$10.65	$10.65	$9.45

SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$99.50	$99.50	$99.50	$99.50	$84.50
Wire rods, 7/32-5/8" Pitts.	6.40	6.40	6.40	6.40	5.375

PIG IRON, Gross Ton	Feb. 15 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pittsburgh	$67.00	$67.00	$67.00	$67.00	$59.50
Basic, Valley	66.00	66.00	66.00	66.00	58.50
Basic, deld., Philadelphia	70.18	70.18	70.18	70.41	62.16
No. 2 Fdry, NevilleIsland,Pa.	66.50	66.50	66.50	66.50	59.00
No. 2 Fdry, Chicago	66.50	66.50	66.50	66.50	59.00
No. 2 Fdry, deld., Phila.	70.68	70.68	70.68	70.91	62.66
No. 2 Fdry, Birmingham	62.50	62.50	62.50	62.50	55.00
No. 2 Fdry (Birm.),deld.,Cin.	70.20	70.20	70.20	70.20	62.70
Malleable, Valley	66.50	66.50	66.50	66.50	59.00
Malleable, Chicago	66.50	66.50	66.50	66.50	59.00
Ferromanganese, net tons†	245.00	245.00	245.00	245.00	205.00

†74-76% Mn, Duquesne, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$31.50	$31.50	$29.50	$40.50	$49.00
No. 1 Heavy Melt, E. Pa.	39.00	36.00	36.00	40.00	51.00
No. 1 Heavy Melt, Chicago	30.50	30.50	30.50	38.50	47.00
No. 1 Heavy Melt, Valley	32.50	32.50	32.50	43.50	52.50
No. 1 Heavy Melt, Cleve.	29.50	28.50	28.50	40.50	49.50
No. 1 Heavy Melt, Buffalo	27.50	27.50	27.50	36.50	46.50
Rails, Rerolling, Chicago	54.50	54.50	54.50	61.50	66.00
No. 1 Cast, Chicago	41.50	41.50	39.50	50.50	46.50

COKE, Net Ton					
Beehive, Furn., Connlsvl.	$15.00	$15.00	$15.00	$15.00	$14.125
Beehive, Fdry., Connlsvl.	18.25	18.25	18.25	18.25	16.50
Oven, Fdry., Milwaukee	32.00	32.00	32.00	32.00	27.50

Steel Prices

Mill prices as reported to STEEL, Feb. 15, cents per pound except as otherwise noted. *Changes shown in italics.* Code number following mill point indicates producing company. Key to producers, page 99; footnotes, page 103.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)
Munhall,Pa. U5 ....$76.00

INGOTS, Alloy (NT)
Detroit S41 ....$82.00
Economy,Pa. B14 ....82.00
Farrell,Pa. S3 ....82.00
Lowellville,O. S3 ....82.00
Midland,Pa. C18 ....82.00
Munhall,Pa. U5 ....82.00
Sharon,Pa. S3 ....82.00

BILLETS, BLOOMS & SLABS
Carbon Rerolling (NT)
Bartonville,Ill. K4 ..$82.00
Bessemer,Pa. U5 ....80.00
Buffalo R2 ....80.00
Clairton,Pa. U5 ....80.00
Ensley,Ala. T2 ....80.00
Fairfield,Ala. T2 ....80.00
Fontana,Calif. K1 ....90.50
Gary,Ind. U5 ....80.00
Johnstown,Pa. B2 ....80.00
Lackawanna,N.Y. B2 ..80.00
Munhall,Pa. U5 ....80.00
Owensboro,Ky. G8 ....80.00
S.Chicago,Ill. R2, U5 ..80.00
S.Duquesne,Pa. U5 ....80.00
Sterling,Ill. N15 ....80.00
Youngstown R2 ....80.00

Carbon, Forging (NT)
Bessemer,Pa. U5 ....$99.50
Buffalo R2 ....99.50
Canton,O. R2 ....102.00
Clairton,Pa. U5 ....99.50
Conshohocken,Pa. A3 .104.50
Ensley,Ala. T2 ....99.50
Fairfield,Ala. T2 ....99.50
Farrell,Pa. S3 ....99.50
Fontana,Calif. K1 ....109.00
Gary,Ind. U5 ....99.50
Geneva,Utah C11 ....99.50
Houston S5 ....104.50
Johnstown,Pa. B2 ....99.50
Lackawanna,N.Y. B2 ..99.50
LosAngeles B3 ....109.00
Midland,Pa. C18 ....99.50
Munhall,Pa. U5 ....99.50
Owensboro,Ky. G8 ....99.50
Seattle B3 ....109.00
Sharon,Pa. S3 ....99.50
S.Chicago R2, U5, W14 .99.50
S.Duquesne,Pa. U5 ....99.50
S.SanFrancisco B3 ....109.00
Warren,O. C17 ....99.50

Alloy, Forging (NT)
Bethlehem,Pa. B2 ...$119.00
Bridgeport,Conn. C32 ..119.00
Buffalo R2 ....119.00
Canton,O. R2, T7 ....119.00
Conshohocken,Pa. A3 .126.00
Detroit S41 ....119.00
Economy,Pa. B14 ....119.00
Farrell,Pa. S3 ....119.00
Fontana,Calif. K1 ....140.00
Gary,Ind. U5 ....119.00
Houston S5 ....124.00
Ind.Harbor,Ind. Y1 ....119.00
Johnstown,Pa. B2 ....119.00
Lackawanna,N.Y. B2 ..119.00
LosAngeles B3 ....139.00
Lowellville,O. S3 ....119.00
Massillon,O. R2 ....119.00
Midland,Pa. C18 ....119.00
Munhall,Pa. U5 ....119.00
Owensboro,Ky. G8 ....119.00
Seattle(6) B3 ....140.00
Sharon,Pa. S3 ....119.00
S.Chicago R2,U5,W14 ..119.00
S.Duquesne,Pa. U5 ....119.00
Struthers,O. Y1 ....119.00
Warren,O. C17 ....119.00

ROUNDS, SEAMLESS TUBE (NT)
Buffalo R2 ....$122.50
Canton,O. R2 ....125.00
Cleveland R2 ....122.50
Gary,Ind. U5 ....122.50
S.Chicago,Ill. R2,W14 .122.50
S.Duquesne,Pa. U5 ....122.50
Warren,O. C17 ....122.50

SKELP
Aliquippa,Pa. J5 ....5.05
Benwood,W.Va. W10 ...5.05
Ind.Harbor,Ind. Y1 ....5.05
Munhall,Pa. U5 ....5.05
Pittsburgh J5 ....5.05
Warren,O. R2 ....5.05
Youngstown R2, U5 ....5.05

WIRE RODS
AlabamaCity,Ala. R2 ..6.40
Aliquippa,Pa. J5 ....6.40
Alton,Ill. L1 ....6.60
Bartonville,Ill. K4 ....6.50
Buffalo W12 ....6.40
Cleveland A7 ....6.40
Donora,Pa. A7 ....6.40
Fairfield,Ala. T2 ....6.40
Houston S5 ....6.65
IndianaHarbor,Ind. Y1..6.40
Johnstown,Pa. B2 ....6.40
Joliet,Ill. A7 ....6.40
KansasCity,Mo. S5 ....6.65
Kokomo,Ind. C16 ....6.50
LosAngeles B3 ....7.20
Minnequa,Colo. C10 ....6.65
Monessen,Pa. P7 ....6.40
Pittsburg,Calif. C11 ....7.20
Portsmouth,O. P12 ....6.40
Roebling,N.J. R5 ....6.50
S.Chicago,Ill. R2, W14..6.40
SparrowsPoint,Md. B2 ..6.50
Sterling,Ill.(1) N15 ....6.40
Sterling,Ill. N15 ....6.50
Struthers,O. Y1 ....6.40
Worcester,Mass. A7 ....6.70

STRUCTURALS

Carbon Steel Std. Shapes
AlabamaCity,Ala. R2 ...5.50
Aliquippa,Pa. J5 ....5.50
Atlanta A11 ....5.70
Bessemer,Ala. T2 ....5.50
Bethlehem,Pa. B2 ....5.55
Birmingham C15 ....5.50
Clairton,Pa. U5 ....5.50
Fairfield,Ala. T2 ....5.50
Fontana,Calif. K1 ....6.30
Gary,Ind. U5 ....5.50
Geneva,Utah C11 ....5.50
Houston S5 ....5.60
Ind.Harbor,Ind. I-2, Y1 .5.50
Johnstown,Pa. B2 ....5.55
Joliet,Ill. P22 ....5.50
KansasCity,Mo. S5 ....5.60
Lackawanna,N.Y. B2 ..5.55
LosAngeles B3 ....6.20
Minnequa,Colo. C10 ....5.80
Munhall,Pa. U5 ....5.50
Niles,Calif. P1 ....6.25
Phoenixville,Pa. P4 ....5.55
Portland,Oreg. O4 ....6.25
Seattle B3 ....6.25
S.Chicago,Ill. U5, W14 .5.50
S.SanFrancisco B3 ....6.15
Sterling,Ill. N15 ....5.50
Torrance,Calif. C11 ....6.20
Weirton,W.Va. W6 ....5.50

Wide Flange
Bethlehem,Pa. B2 ....5.55
Clairton,Pa. U5 ....5.50
Fontana,Calif. K1 ....6.45
IndianaHarbor,Ind. I-2..5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 ....5.50
Phoenixville,Pa. P4 ....5.55
S.Chicago,Ill. U5 ....5.50
Sterling,Ill. N15 ....5.50
Weirton,W.Va. W6 ....5.50

Alloy Std. Shapes
Aliquippa,Pa. J5 ....6.80
Clairton,Pa. U5 ....6.80
Gary,Ind. U5 ....6.80
Houston S5 ....6.90
Munhall,Pa. U5 ....6.80
S.Chicago,Ill. U5, W14..6.80

H.S., L.A., Std. Shapes
Aliquippa,Pa. J5 ....8.05
Bessemer,Ala. T2 ....8.05
Bethlehem,Pa. B2 ....8.10
Clairton,Pa. U5 ....8.05
Fairfield,Ala. T2 ....8.05
Fontana,Calif. K1 ....8.85
Gary,Ind. U5 ....8.05
Geneva,Utah C11 ....8.05
Houston S5 ....8.15
Ind.Harbor,Ind. I-2, Y1.8.05
Johnstown,Pa. B2 ....8.10
KansasCity,Mo. S5 ....8.15
Lackawanna,N.Y. B2 ..8.10
LosAngeles B3 ....8.75
Munhall,Pa. U5 ....8.05
Seattle B3 ....8.80
S.Chicago,Ill. U5, W14..8.05
S.SanFrancisco B3 ....8.70
Sterling,Ill. N15 ....7.75
Struthers,O. Y1 ....8.05

H.S., L.A., Wide Flange
Bethlehem,Pa. B2 ....8.10
Ind.Harbor,Ind. I-2 ....8.05
Lackawanna,N.Y. B2 ..8.10
Munhall,Pa. U5 ....8.05
S.Chicago,Ill. U5 ....8.05
Sterling,Ill. N15 ....7.75

PILING

BEARING PILES
Bethlehem,Pa. B2 ....5.55
Ind.Harbor,Ind. I-2 ....5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 ....5.50
S.Chicago,Ill. I-2, U5 ..5.50

STEEL SHEET PILING
Ind.Harbor,Ind. I-2 ....6.50
Lackawanna,N.Y. B2 ....6.50
Munhall,Pa. U5 ....6.50
S.Chicago,Ill. I-2, U5 ....6.50
Weirton,W.Va. W6 ....6.50

PLATES

PLATES, Carbon Steel
AlabamaCity,Ala. R2 ...5.30
Aliquippa,Pa. J5 ....5.30
Ashland,Ky.(15) A10 ...5.30
Atlanta A11 ....5.50
Bessemer,Ala. T2 ....5.30
Clairton,Pa. U5 ....5.30
Claymont,Del. P4 ....5.30
Cleveland J5, R2 ....5.30
Coatesville,Pa. L7 ....5.30
Conshohocken,Pa. A3 ..5.30
Ecorse,Mich. G5 ....5.30
Fairfield,Ala. T2 ....5.30
Farrell,Pa. S3 ....5.30
Fontana,Calif.(30) K1 ..6.10
Gary,Ind. U5 ....5.30
Geneva,Utah C11 ....5.30
GraniteCity,Ill. G4 ....5.40
Houston S5 ....5.40
Ind.Harbor,Ind. I-2, Y1 .5.30
Johnstown,Pa. B2 ....5.30
Lackawanna,N.Y. B2 ..5.30
Mansfield,O. E6 ....5.30
Minnequa,Colo. C10 ....6.15
Munhall,Pa. U5 ....5.30
Newport,Ky. A2 ....5.30
Pittsburgh J5 ....5.30
Riverdale,Ill. A1 ....5.30
Seattle B3 ....6.20
Sharon,Pa. S3 ....5.30
S.Chicago,Ill. U5, W14..5.30
SparrowsPoint,Md. B2 ..5.30
Sterling,Ill. N15 ....5.30
Steubenville,O. W10 ....5.30
Warren,O. R2 ....5.30
Youngstown U5, Y1 ....5.30
Youngstown(27) R2 ....5.30

PLATES, Carbon Abras. Resist.
Claymont,Del. P4 ....7.05
Fontana,Calif. K1 ....7.85
Geneva,Utah C11 ....7.95
Houston S5 ....7.15
Johnstown,Pa. B2 ....7.05
SparrowsPoint,Md. B2 ..7.05

PLATES, Wrought Iron
Economy,Pa. B14 ....14.10

PLATES, H.S., L.A.
Aliquippa,Pa. J5 ....7.95
Ashland,Ky. A10 ....7.95
Bessemer,Ala. T2 ....7.95
Clairton,Pa. U5 ....7.95
Claymont,Del. P4 ....7.95
Cleveland J5, R2 ....7.95
Coatesville,Pa. L7 ....7.95
Conshohocken,Pa. A3 ..7.95
Economy,Pa. B14 ....7.95
Ecorse,Mich. G5 ....7.95
Fairfield,Ala. T2 ....7.95
Farrell,Pa. S3 ....7.95
Fontana,Calif.(30) K1 ..8.75
Gary,Ind. U5 ....7.95
Geneva,Utah C11 ....7.95
Houston S5 ....8.05
Ind.Harbor,Ind. I-2, Y1.7.95
Johnstown,Pa. B2 ....7.95
Munhall,Pa. U5 ....7.95
Pittsburgh J5 ....7.95
Seattle B3 ....8.85
Sharon,Pa. S3 ....7.95
S.Chicago,Ill. U5, W14..7.95
SparrowsPoint,Md. B2 ..7.95
Sterling,Ill. N15 ....7.625
Warren,O. R2 ....7.95
Youngstown U5, Y1 ....7.95

PLATES, Alloy
Aliquippa,Pa. J5 ....7.50
Claymont,Del. P4 ....7.50
Coatesville,Pa. L7 ....7.50
Economy,Pa. B14 ....7.50
Farrell,Pa. S3 ....7.50
Fontana,Calif. K1 ....8.30
Gary,Ind. U5 ....7.50
Houston S5 ....7.60
Ind.Harbor,Ind. Y1 ....7.50
Johnstown,Pa. B2 ....7.50
Lowellville,O. S3 ....7.50
Munhall,Pa. U5 ....7.50
Newport,Ky. A2 ....7.50
Pittsburgh J5 ....7.50
Seattle B3 ....8.40
Sharon,Pa. S3 ....7.50
S.Chicago,Ill. U5, W14..7.50
SparrowsPoint,Md. B2 ..7.50
Youngstown Y1 ....7.50

FLOOR PLATES
Cleveland J5 ....6.375
Claymont,Del. P4 ....6.375
Conshohocken,Pa. A3 ..6.375
Ind.Harbor,Ind. I-2 ....6.375
Munhall,Pa. U5 ....6.375
Pittsburgh J5 ....6.375
S.Chicago,Ill. U5 ....6.375

PLATES, Ingot Iron
Ashland c.l.(15) A10 ...5.55
Ashland l.c.l.(15) A10 ..6.05
Cleveland c.l. R2 ....6.05
Warren,O. R2 ....6.05

BARS

BARS, Hot-Rolled Carbon
(Merchant Quality)
Ala.City,Ala.(9) R2 ...5.675
Aliquippa,Pa.(9) J5 ...5.675
Alton,Ill. L1 ....5.875
Atlanta(9) A11 ....5.875
Bessemer,Ala.(9) T2 ..5.675
Birmingham(9) C15 ...5.675
Buffalo(9) R2 ....5.675
Canton,O.(23) R2 ....6.15
Clairton,Pa.(9) U5 ....5.675
Cleveland(9) R2 ....5.675
Ecorse,Mich.(9) G5 ...5.675
Emeryville,Calif. J7 ...6.425
Fairfield,Ala.(9) T2 ...5.675
Fairless,Pa.(9) U5 ....5.825
Fontana,Calif.(9) K1 ..6.375
Gary,Ind.(9) U5 ....5.675
Houston(9) S5 ....5.925
Ind.Harbor(9) I-2, Y1..5.675
Johnstown,Pa.(9) B2 ..5.675
Joliet,Ill. P2 ....5.675
KansasCity,Mo.(9) S5..5.925
Lackawanna(9) B2 ....5.675
LosAngeles(9) B3 ....6.375
Massillon,O.(23) R2 ....6.15
Midland,Pa.(23) C18 ..6.025
Milton,Pa. M18 ....5.825
Minnequa,Colo. C10 ...6.125
Niles,Calif. P1 ....6.375
Owensboro,Ky.(9) G8 ..6.025
Pittsburg,Calif.(9) C11.6.375
Pittsburgh(9) J5 ....5.675
Portland,Oreg. O4 ....6.425
Riverdale,Ill.(9) A1 ...5.675
Seattle(9) A24,B3,N15 .6.425
S.Ch'c'go(9)R2,U5,W14 5.675
S.Duquesne,Pa.(9) U5..5.675
S.SanFran.,Calif.(9)B3 6.425
Sterling,Ill.(1)(9) N15..5.675
Sterling,Ill.(9) N15 ....5.775
Struthers,O.(9) Y1 ....5.675
Tonawanda,N.Y. B12 ..5.675
Torrance,Calif.(9) C11 .6.375
Warren,O. C17 ....6.025
Youngstown(9) R2,U5..5.675

BARS, Hot-Rolled Alloy
Aliquippa,Pa. J5 ....6.725
Bethlehem,Pa. B2 ....6.725
Bridgeport,Conn. C32 ...6.80
Buffalo R2 ....6.725
Canton,O. R2, T7 ....6.725
Clairton,Pa. U5 ....6.725
Detroit S41 ....6.725
Economy,Pa. B14 ....6.725
Ecorse,Mich. G5 ....6.725
Farrell,Pa. S3 ....6.725
Fontana,Calif. K1 ....7.775
Gary,Ind. U5 ....6.725
Houston S5 ....6.975
Ind.Harbor,Ind. I-2, Y1 6.725
Johnstown,Pa. B2 ....6.725
KansasCity,Mo. S5 ....6.975
Lackawanna,N.Y. B2 ..6.725
LosAngeles B3 ....7.775
Lowellville,O. S3 ....6.725
Massillon,O. R2 ....6.725
Midland,Pa. C18 ....6.725
Owensboro,Ky. G8 ....6.725
Pittsburgh J5 ....6.725
Seattle(6) B3 ....7.825
Sharon,Pa. S3 ....6.725
S.Chicago R2, U5, W14.6.725
S.Duquesne,Pa. U5 ....6.725
Struthers,O. Y1 ....6.725
Warren,O. C17 ....6.725
Youngstown U5 ....6.725

BARS & SMALL SHAPES, H.R.
High-Strength, Low-Alloy
Aliquippa,Pa. J5 ....8.30
Bessemer,Ala. T2 ....8.30
Bethlehem,Pa. B2 ....8.30
Clairton,Pa. U5 ....8.30
Cleveland R2 ....8.30
Ecorse,Mich. G5 ....8.30
Fairfield,Ala. T2 ....8.30
Fontana,Calif. K1 ....9.00
Gary,Ind. U5 ....8.30
Houston S5 ....8.55
Ind.Harbor,Ind. Y1 ....8.30
Johnstown,Pa. B2 ....8.30
KansasCity,Mo. S5 ....8.55
Lackawanna,N.Y. B2 ..8.30
LosAngeles B3 ....9.00
Pittsburgh J5 ....8.30
Seattle B3 ....9.05
S.Chicago,Ill. R2, W14..8.30
S.Duquesne,Pa. U5 ....8.30
S.SanFrancisco B3 ....9.05
Sterling,Ill. N15 ....7.925
Struthers,O. Y1 ....8.30
Youngstown U5 ....8.30

BAR SIZE ANGLES; H.R. Carbon
Bethlehem,Pa.(9) B2 ..5.825
Houston(9) S5 ....5.925
KansasCity,Mo.(9) S5..5.925
Lackawanna(9) B2 ...5.675
Sterling,Ill. N15 ....5.775
Sterling,Ill.(1) N15 ...5.675
Tonawanda,N.Y. B12 ..5.675

BAR SIZE ANGLES; S. SHAPES
Aliquippa,Pa. J5 ....5.675
Atlanta A11 ....5.875
Joliet,Ill. P22 ....5.675
Minnequa,Colo. C10 ...6.125
Niles,Calif. P1 ....6.375
Pittsburgh J5 ....5.675
Portland,Oreg. O4 ....6.425
SanFrancisco S7 ....6.52
Seattle B3 ....6.425

BAR SIZE ANGLES; S. SHAPES
Wrought Iron
Economy,Pa. B14 ....16.45

BAR SHAPES, Hot-Rolled Alloy
Aliquippa,Pa. J5 ....6.80
Clairton,Pa. U5 ....6.80
Gary,Ind. U5 ....6.80
Houston S5 ....7.05
KansasCity,Mo. S5 ....7.05
Pittsburgh J5 ....6.80
Youngstown U5 ....6.80

BARS, C.F. Iengths
(Including leaded extra)
Carbon
LosAngeles P2, S30 ..11.75*
Alloy
Ambridge,Pa. W18 ...10.175
BeaverFalls,Pa. M12 ..10.175
Camden,N.J. P13 ....10.35
Chicago W18 ....10.175
Elyria,O. W8 ....10.175
Monaca,Pa. S17 ....10.175
Newark,N.J. W18 ....10.35
SpringCity,Pa. K3 ....10.35

*Grade A; add 0.5c for Grade B.

BARS, Cold-Finished Carbon
Ambridge,Pa. W18 ....7.65
BeaverFalls,Pa. M12,R2.7.65
Birmingham C15 ....8.25
Buffalo B5 ....7.70
Camden,N.J. P13 ....8.10
Carnegie,Pa. C12 ....7.65
Chicago W18 ....7.65
Cleveland A7, C20 ....7.65
Detroit B5, P17 ....7.85
Detroit S41 ....7.65
Donora,Pa. A7 ....7.65
Elyria,O. W8 ....7.65
FranklinPark,Ill. N5 ...7.65
Gary,Ind. R2 ....7.65
GreenBay,Wis. F7 ....7.65
Hammond,Ind. J5, L2 ..7.65
Hartford,Conn. R2 ....8.15
Harvey,Ill. B5 ....7.65
LosAngeles(49) S30 ....9.10
LosAngeles(49) P2, R2..9.10
Mansfield,Mass. B5 ....8.20
Massillon,O. R2, R8 ....7.65
Midland,Pa. C18 ....7.65
Monaca,Pa. S17 ....7.65
Newark,N.J. W18 ....8.10
NewCastle,Pa.(17) B4 ..7.65
Pittsburgh J5 ....7.65
Plymouth,Mich. P5 ....7.90
Putnam,Conn. W18 ....8.20
Readville,Mass. C14 ....8.20
Seattle(49) S30 ....9.10
S.Chicago,Ill. W14 ....7.65
SpringCity,Pa. K3 ....8.10
Struthers,O. Y1 ....7.65
Warren,O. C17 ....7.65
Waukegan,Ill. A7 ....7.65
Willimantic,Conn. J5 ..8.15
Youngstown F3, Y1 ....7.65

BARS, Cold-Finished Carbon
(Turned and Ground)
Cumberland,Md.(5) C19.6.55

BARS, Cold-Finished Alloy
Ambridge,Pa. W18 ....9.025
BeaverFalls,Pa. M12,R2 9.025
Bethlehem,Pa. B2 ....9.025
Bridgeport,Conn. C32 ..9.175
Buffalo B5 ....9.025
Camden,N.J. P13 ....9.20
Canton,O. T7 ....9.025
Carnegie,Pa. C12 ....9.025
Chicago W18 ....9.025
Cleveland A7, C20 ....9.025
Detroit B5, P17 ....9.225
Detroit S41 ....9.025
Donora,Pa. A7 ....9.025
Elyria,O. W8 ....9.025
FranklinPark,Ill. N5 ..9.025
Gary,Ind. R2 ....9.025
GreenBay,Wis. F7 ....9.025
Hammond,Ind. J5, L2..9.025
Hartford,Conn. R2 ....9.325
Harvey,Ill. R5 ....9.025
Lackawanna,N.Y. B3 ..9.025
LosAngeles P2, S30 ...11.00
Mansfield,Mass. B5 ....9.325
Massillon,O. R2, R8 ..9.025
Midland,Pa. C18 ....9.025
Monaca,Pa. S17 ....9.025
Newark,N.J. W18 ....9.20
Plymouth,Mich. P5 ....9.225
S.Chicago,Ill. W14 ....9.025
SpringCity,Pa. K3 ....9.20

Struthers,O. Y1 .....9.025
Warren,O. C17 .....9.025
Waukegan,Ill. A7 ....9.025
Willimantic,Conn. J5 ..9.325
Worcester,Mass. A7 ...9.325
Youngstown F3, Y1 ....9.025

BARS, Reinforcing, Billet (To Fabricators)

AlabamaCity,Ala. R2 ..5.675
Atlanta A11 .....5.25
Birmingham C15 .....5.25
Buffalo R2 .....5.675
Cleveland R2 .....5.675
Ecorse,Mich. G5 .....5.675
Emeryville,Calif. J7 ...6.425
Fairfield,Ala. T2 .....5.675
Fairless,Pa. U5 .....5.825
Fontana,Calif. K1 ....6.375
Ft.Worth,Tex.(26) T4 ..5.50
Gary,Ind. U5 .....5.675
Houston S5 .....5.675
Ind.Harbor,Ind. I-2, Y1.5.675
Johnstown,Pa. B2 ....5.675
Joliet,Ill. P22 .....5.675
KansasCity,Mo. S5 ....5.675
Kokomo,Ind. C16 .....5.775
Lackawanna,N.Y. B2..5.675
LosAngeles B3 .....6.375
Madison,Ill. L1 .....5.875
Milton,Pa. M18 .....5.825
Minnequa,Colo. C10 ....6.125
Niles,Calif. P1 .....6.375
Pittsburg,Calif. C11 ..6.375
Pittsburgh J5 .....5.675
Portland,Oreg. O4 ...6.425
SandSprings,Okla. S5 ..5.675
Seattle A24, B3, N14 ..6.425
S.Chicago,Ill. R2, W14.5.675
S.Duquesne,Pa. U5 ....5.675
S.SanFrancisco B3 ....6.425
SparrowsPoint,Md. B2..5.675
Steelton,Pa. B2 .....5.675
Sterling,Ill.(1) N15 ...5.675
Sterling,Ill. N15 .....5.775
Struthers,O. Y1 .....5.675
Tonawanda,N.Y. B12 ...6.10
Torrance,Calif. C11 ..6.375
Youngstown R2, U5 ..5.675

BARS, Reinforcing, Billet (Fabricated: to Consumers)

Baltimore B2 .....7.42
Boston B2, U8 .....8.15
Chicago U8 .....7.41
Cleveland U8 .....7.39
Houston S5 .....7.35
Johnstown,Pa. B2 .....7.33
KansasCity,Mo. S5 .....7.35
Lackawanna,N.Y. B2 ..7.35
Marion,O. P11 .....6.70
Newark,N.J. U8 .....7.80
Philadelphia U8 .....7.63
Pittsburgh J5, U8 .....7.35
SandSprings,Okla. S5 ...7.35
Seattle A24, B3, N14 ...7.95
SparrowsPoint,Md. B2 ..7.33
St.Paul U8 .....8.17
Williamsport,Pa. S19 ..7.25

BARS, Wrought Iron

Economy,Pa.(S.R.)B14 15.10
Economy,Pa.(D.R.)B14 19.30
Econ.(DirectRolled)B14 13.55
Economy(Staybolt)B14 19.80
McK.Rks.(S.R.) L5 ...14.50
McK.Rks.(D.R.) L5 ...19.80
McK.Rks.(Staybolt)L5. 20.95

BARS, Rail Steel

ChicagoHts.(3) C2, I-2.5.575
ChicagoHts.(4)(44) I-2.5.675
ChicagoHts.(4) C2 ....5.675
Franklin,Pa.(3) F5 ....5.575
Franklin,Pa.(4) F5 ....5.675
JerseyShore,Pa.(3) J8 ..5.55
Marion,O.(3) P11 ....5.575
Tonawanda(3) B12 ...5.575
Tonawanda(4) B12 ....6.10

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

AlabamaCity,Ala. R2 ...5.10
Allenport,Pa. P7 .....5.10
Aliquippa,Pa. J5 .....5.10
Ashland,Ky.(8) A10 ....5.10
Cleveland J5, R2 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit(8) M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Fairless,Pa. U5 .....5.15
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....5.10
Geneva,Utah C11 .....5.20
GraniteCity,Ill.(8) G4 ..5.20
Ind.Harbor,Ind. I-2, Y1.5.10
Irvin,Pa. U5 .....5.10
Lackawanna,N.Y. B2 ..5.10
Mansfield,O. E6 .....5.10
Munhall,Pa. U5 .....5.10
Newport,Ky. A2 .....5.10
Niles,O. M21, S3 .....5.10
Pittsburg,Calif. C11 ....5.80
Pittsburgh J5 .....5.10
Portsmouth,O. P12 .....5.10
Riverdale,Ill. A1 .....5.10
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. U5, W14..5.10
SparrowsPoint,Md. B2 ..5.10
Steubenville,O. W10 ....5.10
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5, Y1 ....5.10

SHEETS, H.R. (19 Ga. & Lighter)

Niles,O. M21, S3 .....6.275

SHEETS, H.R. Alloy

Gary,Ind. U5 .....8.40
Ind.Harbor,Ind. Y1 ....8.40
Irvin,Pa. U5 .....8.40
Munhall,Pa. U5 .....8.40
Newport,Ky. A2 .....8.40
Youngstown U5, Y1 ....8.40

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....7.525
Ashland,Ky. A10 .....7.525
Cleveland J5, R2 .....7.525
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.525
Fairless,Pa. U5 .....7.575
Farrell,Pa. S3 .....7.525
Fontana,Calif. K1 ....8.25
Gary,Ind. U5 .....7.525
Ind.Harbor,Ind. I-2, Y1 7.525
Irvin,Pa. U5 .....7.525
Lackawanna(35) B2 ...7.525
Munhall,Pa. U5 .....7.525
Niles,O. S3 .....7.525
Pittsburgh J5 .....7.525
S.Chicago,Ill. U5, W14.7.525
Sharon,Pa. S3 .....7.525
SparrowsPoint(36) B2..7.525
Warren,O. R2 .....7.525
Weirton,W.Va. W6 ....7.525
Youngstown U5, Y1 ...7.525

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ...5.35
Cleveland R2 .....5.875
Warren,O. R2 .....5.875

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....7.05
Middletown,O. A10 ....6.775
Warren,O. R2 .....7.05

SHEETS, Cold-Rolled Steel (Commercial Quality)

AlabamaCity,Ala. R2 ..6.275
Aliquippa,Pa. J5 .....6.275
Allenport,Pa. P7 .....6.275
Cleveland J5, R2 .....6.275
Conshohocken,Pa. A3 ..6.325
Detroit M1 .....6.275
Ecorse,Mich. G5 .....6.275
Fairfield,Ala. T2 .....6.275
Fairless,Pa. U5 .....6.325
Follansbee,W.Va. F4 ..6.275
Fontana,Calif. K1 .....7.40
Gary,Ind. U5 .....6.275
GraniteCity,Ill. G4 ....6.375
Ind.Harbor,Ind. I-2, Y1 6.275
Irvin,Pa. U5 .....6.275
Lackawanna,N.Y. B2 ..6.275
Mansfield,O. E6 .....6.275
Middletown,O. A10 ....6.275
Newport,Ky. A2 .....6.275
Pittsburg,Calif. C11 ..7.225
Pittsburgh J5 .....6.275
Portsmouth,O. P12 ....6.275
SparrowsPoint,Md. B2..6.275
Steubenville,O. W10 ...6.275
Warren,O. R2 .....6.275
Weirton,W.Va. W6 ....6.275
Yorkville,O. W10 ....6.275
Youngstown Y1 .....6.275

SHEETS, Cold-Rolled, High-Strength, Low-Alloy

Aliquippa,Pa. J5 ....9.275
Cleveland J5, R2 .....9.275
Ecorse,Mich. G5 .....9.275
Fairless,Pa. U5 .....9.325
Fontana,Calif. K1 ....10.40
Gary,Ind. U5 .....9.275
Ind.Harbor,Ind. I-2, Y1 9.275
Lackawanna(38) B2 ..9.275
Pittsburgh J5 .....9.275
SparrowsPoint(33) B2..9.275
Warren,O. R2 .....9.275
Weirton,W.Va. W6 ....9.275
Youngstown Y1 .....9.275

SHEETS, Culvert

	Cu Steel	Cu Fe
Ala.City,Ala. R2	7.225	....
Ashland,Ky. A10	7.225	7.475
Canton,O. R2	7.225	....
Fairfield,Ala. T2	7.225	7.475
Gary,Ind. U5	7.225	7.475
GraniteCity,Ill. G4	7.325	....
Ind.Harbor I-2	7.225	7.475
Irvin,Pa. U5	7.225	7.475
MartinsFry. W10	7.225	7.475
Pitts.,Calif. C11	7.975	....
Pittsburgh J5	7.225	....
SparrowsPt. B2	7.225	....

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 ...7.475

SHEETS, Enameling

Ashland,Ky. A10 .....6.775
Cleveland R2 .....6.775
Fairfield,Ala. T2 .....6.775
Gary,Ind. U5 .....6.775
Ind.Harbor,Ind. I-2, Y1 6.775
Irvin,Pa. U5 .....6.775
Middletown,O. A10 ....6.775
Niles,O. M21, S3 .....6.775
SparrowsPoint,Md. B2..6.775
Youngstown Y1 .....6.775

BLUED STOCK, 29 Gage

Dover,O. E6 .....8.70
Ind.Harbor,Ind. I-2 ....8.70
Mansfield,O. E6 .....8.70
Warren,O. R2 .....8.70
Yorkville,O. W10 .....8.70

SHEETS, Long Terne, Steel

Follansbee,W.Va. W10 .7.225
Gary,Ind. U5 .....7.225
Mansfield,O. E6 .....7.225
Middletown,O. A10 ....7.225
Niles,O. M21, S3 .....7.225
Warren,O. R2 .....7.225

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....7.625

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1) 9.525
Butler,Pa. A10 (type 2) 9.625
Irvin,Pa. U5 (type 1) ..9.525

SHEETS, Well Casing

Fontana,Calif. K1 ....7.325
Geneva,Utah C11 .....6.80

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....10.125
Pittsburgh J5 .....10.125
SparrowsPt.(39) B2 ..10.025

SHEETS, Galvannealed Steel

Canton,O. R2 .....7.275
Irvin,Pa. U5 .....7.275

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 ....7.125
Middletown,O. A10 ....7.125

SHEETS, Electrogalvanized

Cleveland(28) R2 .....7.65
Niles,O.(28) R2 .....7.65
Weirton,W.Va. W6 ....7.50

SHEETS, Galvanized Steel Hot-Dipped

AlabamaCity,Ala. R2..6.875‡
Ashland,Ky. A10 ....6.875‡
Canton,O. R2 .....6.875‡
Dover,O. E6 .....6.875†
Fairfield,Ala. T2 ....6.875†
Gary,Ind. U5 .....6.875†
GraniteCity,Ill. G4 ...6.975*
Ind.Harbor,Ind. I-2 ..6.875†
Irvin,Pa. U5 .....6.875†
Kokomo,Ind. C16 ....6.975‡
MartinsFerry,O. W10..6.875*
Middletown,O. A10 ..6.875†
Pittsburg,Calif. C11 ..7.625*
Pittsburgh J5 .....6.875†
SparrowsPt.,Md. B2 ..6.875†
Warren,O. R2 .....6.875†
Weirton,W.Va. W6 ..6.875*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

Key to Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.
A24 Alaska Steel Mills Inc.
A25 Algoma Steel Corp. Ltd.

B1 Babcock & Wilcox
B2 Bethlehem Steel Co.
B3 Bethlehem Steel Co., Pacific Coast Div.
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C4 Carpenter Steel Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co., Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
C32 Carpenter Steel of N.Eng.

D2 Detroit Steel Corp.
D4 Disston Div., H. K. Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas&Fuel Assoc.
E2 Eastern Stainless Steel
E6 Empire-Reeves Steel
E10 Enamel Prod. & Plating

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
G8 Green River Steel Corp.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins Steel Tube Works
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L6 Lone Star Steel Co.
L7 Lukens Steel Co.
L8 Leschen Wire Rope Div., H. K. Porter Co. Inc.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M14 McInnes Steel Co.
M16 Md. Fine & Specialty Wire Co. Inc.
M17 Metal Forming Corp.
M18 Milton Steel Div., Merritt-Chapman&Scott
M21 Mallory-Sharon Metals Corp.
M22 Mill Strip Products Co.
M23 Mill Strip Products Co. of Pennsylvania

N1 National-Standard Co.
N2 National Supply, Armco Steel Corp.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N14 Northwest. Steel Rolling Mills Inc.
N15 Northwestern S.&W. Co.
N20 Neville Ferro Alloy Co.

O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Div., Detroit Steel Corp.
P13 Precision Drawn Steel
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., American Chain & Cable
P17 Plymouth Steel Corp.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
P24 Phil. Steel & Wire Corp.

R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div., Eaton Mfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Div., Copperweld Steel Co.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Div., Bliss & Laughlin Inc.
S40 Seneca Steel Service
S41 Stainless & Strip Div., J & L Steel Corp.
S42 Southern Elec. Steel Co.
S43 Seymour Mfg. Co.
S44 Screw & Bolt Corp. of America
S45 Somers Brass Co.
S46 Steel Co. of Canada

T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Products & Chemical Corp.
T4 Texas Steel Co.
T5 Thomas Strip Div., Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U3 Union Wire Rope, Armco Steel Corp.
U4 Universal-Cyclops Steel
U5 U. S. Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div., U. S. Steel Corp.
U11 Union Carbide Metals Co.
U13 Union Steel Corp.

V2 Vanadium-Alloy Steel
V3 Vulcan-Kidd Steel Div., H. K. Porter Co.

W1 Wallace Barnes Steel Div., Associated Spring
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.

Y1 Youngstown Sheet & Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala. (27) R2 ...5.10
LosAngeles B3 .....9.60
Allenport,Pa. P7 .....5.10
Alton,Ill. L1 .....5.30
Ashland,Ky.(8) A10 ...5.10
Atlanta A11 .....5.10
Bessemer,Ala. T2 .....5.10
Birmingham C15 .....5.10
Conshohocken,Pa. A3 ...5.15
Detroit M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Farrell,Pa. S3 .....5.10
Lowellville,O. S3 .....8.40
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....5.10
Ind.Harbor,Ind. I-2, Y1..5.10
Johnstown,Pa.(25) B2 ..5.10
Lackaw'na,N.Y.(25) B2.5.10
LosAngeles(25) B3 .....5.85
LosAngeles C1 .....8.60
Minnequa,Colo. C10 ....6.20
Riverdale,Ill. A1 .....5.10
SanFrancisco S7 .....6.60
Seattle(25) B3 .....6.10
Seattle N14 .....6.60
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. W14 .....5.10
S.SanFrancisco(25) B3..5.85
SparrowsPoint,Md. B2 ..5.10
Torrance,Calif. C11 ....5.85
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5 .....5.10

STRIP, Hot-Rolled Alloy

Carnegie,Pa. S18 .....8.40
Farrell,Pa. S3 .....8.40
Gary,Ind. U5 .....8.40
Houston S5 .....8.65
Ind.Harbor,Ind. Y1 ....8.40
KansasCity,Mo. S5 .....8.65
Newport,Ky. A2 .....8.40
Sharon,Pa. A2, S3 ....8.40
S.Chicago,Ill. W14 .....8.40
Youngstown U5, Y1 ....8.40

STRIP, Hot-Rolled High-Strength, Low-Alloy

Ashland,Ky. A10 .....7.575
Bessemer,Ala. T2 .....7.575
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.575
Fairfield,Ala. T2 .....7.575
Farrell,Pa. S3 .....7.575
Gary,Ind. U5 .....7.575
Ind.Harbor,Ind. I-2, Y1 7.575
Lackawanna,N.Y. B2 ..7.575
LosAngeles(25) B3 ....8.325
Seattle(25) B3 .....8.575
Sharon,Pa. S3 .....7.575
S.Chicago,Ill. W14 ....7.575
S.SanFrancisco(25) B3.8.325
SparrowsPoint,Md. B2 .7.575
Warren,O. R2 .....7.575
Weirton,W.Va. W6 ....7.575
Youngstown U5, Y1 ....7.575

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10 ...5.35
Warren,O. R2 .....5.875

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6 .....7.425
Baltimore T6 .....7.425
Boston T6 .....7.975
Buffalo S40 .....7.425
Cleveland A7, J5 ....7.425
Dearborn,Mich. S3 ....7.425
Detroit D2, M1, P20 ..7.425
Dover,O. G6 .....7.425
Evanston,Ill. M22 ....7.525
Farrell,Pa. S3 .....7.425
Follansbee,W.Va. W10 .7.425
Fontana,Calif. K1 .....9.20
FranklinPark,Ill. T6 ..7.525
Ind.Harbor,Ind. Y1 ....7.425
Indianapolis S41 .....7.575
LosAngeles C1, S41 ....9.30
McKeesport,Pa. E10 ..7.525
NewBedford,Mass. R10.7.875
NewBritain,Conn. S15 .7.875
NewCastle,Pa. B4, M23 7.425
NewHaven,Conn. D2 ...7.875
NewKensington,Pa. A6.7.425
Pawtucket,R.I. R3, N8.7.975
Philadelphia P24 .....7.875
Pittsburgh J5 .....7.425
Riverdale,Ill. A1 .....7.525
Rome,N.Y.(32) R6 ....7.425
Sharon,Pa. S3 .....7.425
Trenton,N.J.(31) R5 ..8.875
Warren,O. R2, T5 ....7.425
Worcester,Mass. A7 ...7.975

STRIP, Cold-Rolled Alloy

Boston T6 .....15.90
Cleveland A7 .....15.55
Carnegie,Pa. S18 .....15.55
Dover,O. G6 .....15.55
Farrell,Pa. S3 .....15.55
FranklinPark,Ill. T6 ..15.55
Harrison,N.J. S18 .....15.55
Indianapolis S41 .....15.70
LosAngeles S41 .....17.75
Lowellville,O. S3 .....15.55
Pawtucket,R.I. N8 ....15.90
Riverdale,Ill. A1 .....15.55
Sharon,Pa. S3 .....15.55
Worcester,Mass. A7 ...15.85
Youngstown S41 .....15.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7 .....10.80
Dearborn,Mich. S3 ....10.80
Dover,O. G6 .....10.80
Farrell,Pa. S3 .....10.80
Ind.Harbor,Ind. Y1 ....10.80
Sharon,Pa. S3 .....10.80
Warren,O. R2 .....10.80
Weirton,W.Va. W6 ....10.80
Youngstown Y1 .....10.80

STRIP, Galvanized (Continuous)

Farrell,Pa. S3 .....7.50
Sharon,Pa. S3 .....7.50

STRIP, Cold-Finished Spring Steel (Annealed)

	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Anderson,Ind. G6	9.10	....	....	....	....
Baltimore T6	9.50	10.70	12.90	15.90	18.85
Boston T6	9.50	10.70	12.90	15.90	18.85
Bristol,Conn. W1	....	10.70	12.90	16.10	19.30
Carnegie,Pa. S18	8.95	10.40	12.60	15.60	....
Cleveland A7	8.95	10.40	12.60	15.60	18.55
Dearborn,Mich. S3	9.05	10.50	12.70	....	....
Detroit D2	9.05	10.50	12.70	15.70	....
Dover,O. G6	8.95	10.40	12.60	15.60	18.55
Evanston,Ill. M22	9.05	10.40	12.60	15.60	....
Farrell,Pa. S3	8.95	10.40	12.60	15.60	18.55
Fostoria,O. S1	10.05	10.40	12.60	15.60	....
FranklinPark,Ill. T6	9.05	10.40	12.60	15.60	18.55
Harrison,N.J. C18	....	....	12.90	16.10	19.30
Indianapolis S41	9.10	10.55	12.60	15.60	18.55
LosAngeles C1	11.15	12.60	14.80	17.80	....
LosAngeles S41	11.15	12.60	14.80	....	....
NewBritain,Conn. S15	9.40	10.70	12.90	15.90	18.85
NewCastle,Pa. B4, M23	8.95	10.40	12.60	15.60	....
NewHaven,Conn. D2	9.40	10.70	12.90	15.90	....
NewKensington,Pa. A6	8.95	10.40	12.60	15.60	....
NewYork W3	....	10.70	12.90	16.10	19.30
Pawtucket,R.I. N8	9.50	10.70	12.90	15.90	18.85
Riverdale,Ill. A1	9.05	10.40	12.60	15.60	18.55
Rome,N.Y. R6	8.95	10.40	12.60	15.60	18.55
Sharon,Pa. S3	8.95	10.40	12.60	15.60	18.55
Trenton,N.J. R5	....	10.70	12.90	15.90	18.85
Warren,O. T5	8.95	10.40	12.60	15.60	18.55
Worcester,Mass. A7, T6	9.50	10.70	12.90	15.90	18.85
Youngstown S41	8.95	10.40	12.60	15.60	18.55

Spring Steel (Tempered)			Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	...	...	18.85	22.95	27.80
Buffalo W12	...	...	18.85	....	....
Fostoria,O. S1	...	...	19.05	22.15	....
FranklinPark,Ill. T6	...	...	19.20	23.30	28.15
Harrison,N.J. C18	...	...	18.85	22.95	27.80
NewYork W3	...	...	18.85	22.95	27.80
Palmer,Mass. W12	...	...	18.85	....	....
Trenton,N.J. R5	...	...	18.85	22.95	27.80
Worcester,Mass. A7, T6	...	...	18.85	22.95	27.80
Youngstown S41	...	...	19.20	23.30	28.15

STRIP, C.R., Electrogalvanized

Cleveland A7 .....7.425•
Dover,O. G6 .....7.425•
Evanston,Ill. M22 ....7.525•
McKeesport,Pa. E10 ...7.50•
NewCastle,Pa. M23 ..7.425•
Riverdale,Ill. A1 .....7.525•
Warren,O. B9, S3, T5 .7.425•
Worcester,Mass. A7 ...7.975
Youngstown S41, Y1 .7.425•

•Plus galvanizing extras.

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2 .....8.175

TIGHT COOPERAGE HOOP

Atlanta A11 .....5.825
Farrell,Pa. S3 .....5.525
Riverdale,Ill. A1 .....5.675
Sharon,Pa. S3 .....5.525
Youngstown U5 .....5.525

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$9.10	$9.35	$9.75
Fairfield,Ala. T2	9.20	9.45	9.85
Fairless,Pa. U5	9.20	9.45	9.85
Fontana,Calif. K1	9.75	10.00	10.40
Gary,Ind. U5	9.10	9.35	9.75
GraniteCity,Ill. G4	9.20	9.45	9.85
IndianaHarbor,Ind. I-2, Y1	9.10	9.35	9.75
Irvin,Pa. U5	9.10	9.35	9.75
Niles,O. R2	9.10	9.35	9.75
Pittsburg,Calif. C11	9.75	10.00	10.40
SparrowsPoint,Md. B2	9.10	9.35	9.75
Weirton,W.Va. W6	9.10	9.35	9.75
Yorkville,O. W10	9.10	9.35	9.75

ELECTROLYTIC TIN-COATED SHEET (Dollars per 100 lb)

Aliquippa,Pa. J5 (21-27 Ga.)	....	7.90	8.10	....
IndianaHarbor,Ind. Y1 (20-27 Ga.)	....	7.90	....	....
Niles,O. R2 (20-27 Ga.)	....	7.90	8.10	8.30

ELECTROLYTIC THIN TIN PLATE (¼ lb coating in coils)

	Base Box			
	45 lb	50 lb	55 lb	60 lb
Fairfield,Ala. T2	$6.20	$6.35	$6.50	$6.65
Fairless,Pa. U5	6.20	6.35	6.50	6.65
Gary,Ind. U5	6.10	6.25	6.40	6.55
Irvin,Pa. U5	6.10	6.25	6.40	6.55
SparrowsPoint,Md. B2	6.10	6.25	6.40	6.55
Weirton,W.Va. W6	6.10	6.25	6.40	6.55

TIN PLATE, Hot Dipped Common Coke	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$10.40	$10.65
Fairfield,Ala. T2	10.50	10.75
Fontana,Calif. K1	11.05	11.30
Gary,Ind. U5	10.40	10.65
Irvin,Pa. U5	10.40	10.65
Pitts.,Calif. C11	11.05	11.30
Sp.Pt.,Md. B2	10.40	10.65
Weirton,W.Va. W6	10.40	10.65
Yorkville,O. W10	10.40	10.65

BLACK PLATE (Base Box)

Aliquippa,Pa. J5 .....$8.20
Fairfield,Ala. T2 .....8.30
Fairless,Pa. U5 .....8.30
Fontana,Calif. K1 .....8.85
Gary,Ind. U5 .....8.20
GraniteCity,Ill. G4 .....8.30
Ind.Harbor,Ind. I-2, Y1.8.20
Irvin,Pa. U5 .....8.20
Niles,O. R2 .....8.20
Pittsburg,Calif. C11 ....8.85
SparrowsPoint,Md. B2 ..8.20
Weirton,W.Va. W6 .....8.20
Yorkville,O. W10 .....8.20

HOLLOWARE ENAMELING (Black Plate) (29 Gage)

Aliquippa,Pa. J5 .....7.85
Gary,Ind. U5 .....7.85
GraniteCity,Ill. G4 .....7.95
Ind.Harbor,Ind. Y1 .....7.85
Irvin,Pa. U5 .....7.85
Yorkville,O. W10 .....7.85

SILICON STEEL

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	....	11.70	12.40	13.35	14.65
Brackenridge,Pa. A4	....	....	12.40	13.55	14.65
GraniteCity,Ill. G4	9.975•	11.30•	12.00•	13.15•	....
IndianaHarbor,Ind. I-2	9.875•	11.20•	11.90•	13.05•	....
Mansfield,O. E6	9.875•	11.70	12.40	13.55	14.65
Newport,Ky. A2	9.875	11.70•	12.40•	13.55•	14.65•
Niles,O. M21	9.875•	11.70	12.40	13.55	....
Vandergrift,Pa. U5	9.875•	11.70	12.40	13.55	14.65
Warren,O. R2	9.875•	11.70	12.40	13.55	14.65
Zanesville,O. A10	....	11.70†	12.40	13.55	14.65

	Stator
Mansfield,O. E6	8.10
Vandergrift,Pa. U5	8.10
Warren,O. R2 (Locore)	8.10

SHEETS (22 Ga., coils & cut lengths)

Fully Processed (Semiprocessed ½c lower)	T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	15.70	16.30	16.80	17.85
Zanesville,O. A10	15.70	16.30	16.80	17.85
Vandergrift,Pa. U5	15.70	16.30	16.80	17.85

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	18.10	19.70	20.20	20.70	15.70††
Butler,Pa. A10	....	....	19.70	20.20	20.70	....
Vandergrift,Pa. U5	..	17.10	18.10	19.70	20.20	20.70	15.70
Warren,O. R2	....	....	....	....	....	....	15.70‡

•Semiprocessed. †Fully processed only. ‡Coil annealed; semiprocessed ½c lower. ††Coils only.

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2 ..8.00
Aliquippa,Pa. J5 .....8.00
Alton,Ill. L1 .....8.20
Atlanta A1 .....8.00
Bartonville,Ill. K4 .....8.10
Buffalo W12 .....8.00
Chicago W13 .....8.00
Cleveland A7, C20 ....8.00
Crawfordsville,Ind. M8..8.10
Donora,Pa. A7 .....8.00
Duluth A7 .....8.00
Fairfield,Ala. T2 .....8.00
Fostoria,O.(24) S1 ....8.10
Houston S5 .....8.25
Jacksonville,Fla. M8 ...8.35
Johnstown,Pa. B2 .....8.00
Joliet,Ill. A7 .....8.00
KansasCity,Mo. S5 ....8.25
Kokomo,Ind. C16 .....8.10
LosAngeles B3 .....8.95
Minnequa,Colo. C10 ....8.25
Monessen,Pa. P7, P16..8.00
Palmer,Mass. W12 ....8.30
Pittsburg,Calif. C11 ....8.95
Portsmouth,O. P12 ....8.00
S.Chicago,Ill. R2 .....8.00
S.SanFrancisco C10 ....8.95
SparrowsPoint,Md. B2...8.10
Sterling,Ill.(1) N15 ....8.00
Sterling,Ill. N15 .....8.10
Struthers,O. Y1 .....8.00
Waukegan,Ill. A7 .....8.00
Worcester,Mass. A7 ....8.30

WIRE, Cold Heading Carbon

Elyria,O. W8 .....8.00

WIRE, Gal'd., for ACSR

Bartonville,Ill. K4 ....12.65
Buffalo W12 .....13.40
Cleveland A7 .....12.65
Donora,Pa. A7 .....12.65
Duluth A7 .....12.65
Johnstown,Pa.(10) B2 .12.65
KansasCity,Mo. U3 ...12.90
LosAngeles(2) B3 .....13.60
Minnequa,Colo. C10 ..12.775
Monessen,Pa. P7, P16..12.65
Muncie,Ind. I-7 .....13.60
NewHaven,Conn. A7 ...12.95
Palmer,Mass. W12 ....13.70
Pittsburg,Calif. C11 ....13.45
Portsmouth,O. P12 ....12.65
Roebling,N.J. R5 .....12.95
SparrowsPt.,Md.(10)B2 12.75
Struthers,O. Y1 .....13.40
Trenton,N.J. A7 .....12.95
Waukegan,Ill. A7 .....12.65
Worcester,Mass. A7 ...12.95

WIRE, Upholstery Spring

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Johnstown,Pa. B2 .....9.75
KansasCity,Mo. S5, U3.10.00
Kokomo,Ind. C16 .....9.85
Los Angeles B3 .....10.70
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16...9.75
NewHaven,Conn. A7 ...10.05
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ....10.70
Portsmouth,O. P12 .....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ....9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....9.75
Waukegan,Ill. A7 .....9.75
Worcester,Mass. A7 ...10.05

WIRE, MB Spring, High-Carbon

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Bartonville,Ill. K4 .....9.85
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Fostoria,O. S1 .....9.80
Johnstown,Pa. B2 .....9.75
KansasCity,Mo. S5, U3.10.00
LosAngeles B3 .....10.70
Milbury,Mass.(12) N6 .10.05
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16 ..9.75
Muncie,Ind. I-7 .....9.95
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ....10.70
Portsmouth,O. P12 .....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ....9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....10.05
Waukegan,Ill. A7 .....9.75
Wor'ster,Mass.A7,J4,T6 10.05

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1 .....16.50
Bartonville,Ill. K4 ....16.40
Chicago W13 .....16.30
Cleveland A7 .....16.30
Crawfordsville,Ind. M8.16.40
Fostoria,O. S1 .....16.30
Houston S5 .....16.55
Jacksonville,Fla. M8 ..16.65
Johnstown,Pa. B2 .....16.30
KansasCity,Mo. S5 ....16.55
Kokomo,Ind. C16 .....16.30
Minnequa,Colo. C16 ....16.55
Monessen,Pa. P16 .....16.30
Muncie,Ind. I-7 .....16.50
Palmer,Mass. W12 ....16.60
S.SanFrancisco C10 ....17.15
Waukegan,Ill. A7 .....16.30
Worcester,Mass. A7, J6.16.60

ROPE WIRE (A)

Bartonville,Ill. K4 .....13.45
Buffalo W12 .....13.45
Fostoria,O. S1 .....13.45
Johnstown,Pa. B2 .....13.45
Monessen,Pa. P7 .....13.45
Muncie,Ind. I-7 .....13.65
Palmer,Mass. W12 ....13.75
Portsmouth,O. P12 ....13.45
Roebling,N.J. R5 .....13.75
St.Louis L8 .....13.45
SparrowsPt.,Md. B2 ...13.55
Struthers,O. Y1 .....13.45
Worcester,Mass. J4 ...13.75
(A) Plow and Mild Plow; add 0.25c for Improved Plow.

STEELMAKING AT JESSOP

Listen...

5...4...3...2...1...0...Lift Off!

The countdown is on.

Scientists and skilled technicians scan their instruments, alert to the least sign of malfunction.

Liquid oxygen has been piped into the fuel chamber of the gleaming Atlas ICBM poised on the launching pad. Other last-minute preparations are completed.

Tension mounts. It won't be long. Listen . . .

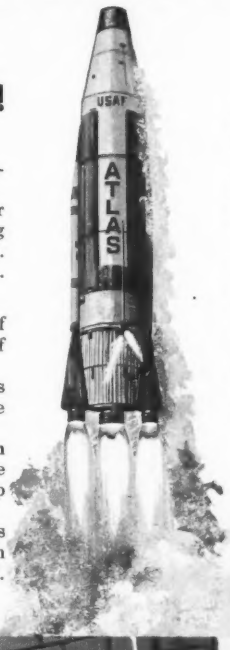
5...4...3...2...1...0...*Lift Off!*

The missile comes to life in a swirling cloud of vapor, exhaust and flame. The engine—capable of 360,000 pounds of thrust—roars thunderously.

Airborne now, the Atlas gathers speed and soars majestically on its predetermined course down the Atlantic range—a successful launching.

Jessop Steel Company makes several alloys used in the Atlas—steels forged and machined into precise but rugged mechanisms. And you will find Jessop steel in the launching pad "plumbing" too.

Swepco Tube Corporation of Clifton, N. J., makes piping for LOX systems that fuel the Atlas with liquid oxygen at temperatures of –300° F. to –320° F. *That's* punishment for any metal.



But Swepco's austenitic chromium nickel Rock-Forged pipe can take it. Ductility—to avoid fracture by reason of brittleness—is an all-important factor in this application.

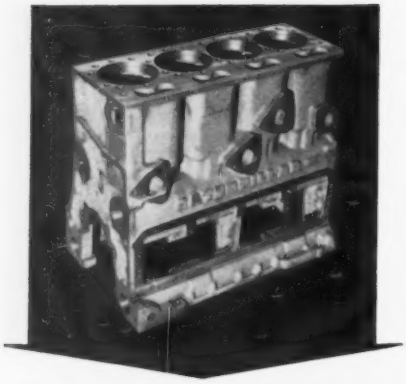
With a value of about 38 foot pounds by Charpy Impact Test, the piping supplied by Swepco handles the job with ease—with an added measure of safety against costly breakdown.

Swepco buys steel from Jessop for rock-forging. Why? Because through controlled chemistry and certain production techniques, Jessop and Swepco developed a steel second to none in workability in the cold forging process.

In making steel like this, experience counts . . . and Jessop has it. Call any of Jessop's 23 sales offices in North America and let us prove it to you.

Plants and Service Centers:
Washington, Pa. • Los Angeles • Chicago • Detroit • Owensboro, Ky. • Wallaceburg, Ont.

JESSOP



1 **5-SPINDLE HORIZONTAL MILLING MACHINE**
Rough mills top of block and pan rail

2 **VERTICAL SPINDLE OPENSIDE MILLER**
Rough mills bearing locks

3 **RISE AND FALL MILLING MACHINE**
Mills sides of main bearing housing and locking slots for inserts

4 **5-SPINDLE HORIZONTAL MILLING MACHINE**
Finish mills pads on sides and rough mills pad for fuel pump

5 **DUPLEX MILLING MACHINE**
Rough mills both ends of block

6 **DOUBLE-SPINDLE VERTICAL MILLING MACHINE**
Finish mills pan rail

7 **COMBINATION OPENSIDE VERTICAL MILLING AND DRILLING MACHINE**
Finish mills bearing locks and re-reams two locating holes

8 **STRAIGHT-LINE MILLING MACHINE WITH VERTICAL AND HORIZONTAL SPINDLES**
Finish mills top face and fuel pump pad

9 **DUPLEX MILLER WITH RETRACTABLE HYDRAULIC SPINDLE**
Finish mills both ends of block

Automatic milling of cylinder blocks keeps production flowing at Caterpillar

At Caterpillar Tractor Co., rough and finish milling of diesel engine blocks is done on a Farrel-Newton line, in the sequence shown at the left. That is one way in which the company maintains a high production rate at its Peoria, Illinois plant.

Consisting of nine special milling machines, each push-button controlled from individual consoles, the line is operated on a continuous-production basis. Locating, clamping, milling and unclamping are automatic, with the machines conveyor linked. They are fixtured for either four- or six-cylinder blocks, and have hydraulically operated loading and unloading devices, where required.

All of the Farrel-Newton machines are constructed on the building-block principle which provides the flexibility necessary for future machine rearrangements.

Why not put Consolidated experience to work on your next milling line project. In the meantime, send for a copy of bulletin 675-A.

FARREL-BIRMINGHAM COMPANY, INC.
CONSOLIDATED MACHINE TOOL DIVISION
565 Blossom Road, Rochester 10, New York
Telephone: BUtler 8-4600
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

FARREL NEWTON

CM-61

WIRE, Tire Bead

Bartonville,Ill. K4	17.15
Monessen,Pa. P16	17.15
Roebling,N.J. R5	17.65

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	12.35
Baltimore T6	12.65
Boston T6	12.65
Buffalo W12	12.35
Chicago W13	12.45
Cleveland A7	12.35
Crawfordsville,Ind. M8	12.35
Dover,O. G6	12.35
Evanston,Ill. M22	12.45
Farrell,Pa. S3	12.35
Fostoria,O. S1	12.35
FranklinPark,Ill. T6	12.45
Kokomo,Ind. C16	12.35
Massillon,O. R8	12.35
Milwaukee C23	12.55
Monessen,Pa. P7, P16	12.35
NewCastle,Pa. M23	12.35
Palmer,Mass. W12	12.65
Pawtucket,R.I. N8	12.65
Philadelphia P24	12.65
Riverdale,Ill. A1	12.45
Rome,N.Y. R6	12.35
Sharon,Pa. S3	12.35
Trenton,N.J. R5	12.65
Warren,O. B9	12.35
Worcester,Mass. A7,T6	12.65

NAILS, Stock Sizes

	Col.
AlabamaCity, Ala. R2	173
Aliquippa,Pa. J5	173
Atlanta A11	173
Bartonville,Ill. K4	175
Chicago W13	173
Cleveland A9	173
Crawfordsville,Ind. M8	175
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	178
Jacksonville,Fla. M8	175
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	178
Monessen,Pa. P7	173
Pittsburg,Calif. C11	192
Rankin,Pa. A7	173
S.Chicago,Ill. R2	173
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

(To Wholesalers: per cwt)

Galveston,Tex. D7	$10.30

NAILS, CUT (100 lb kegs)

Wheeling,W.Va. W10	$10.10

POLISHED STAPLES

	Col.
AlabamaCity,Ala. R2	175
Aliquippa,Pa. J5	173
Atlanta A11	173
Bartonville,Ill. K4	175
Crawfordsville,Ind. M8	177
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	180
Jacksonville,Fla. M8	177
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	180
Kokomo,Ind. C16	177
Minnequa,Colo. C10	178
Pittsburg,Calif. C11	194
Rankin,Pa. A7	173
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

TIE WIRE, Automatic Baler (14½ Ga.) (per 97 lb Net Box) Coil No. 3150

AlabamaCity,Ala. R2	$8.78
Atlanta A11	10.36
Bartonville,Ill. K4	8.88
Buffalo W12	10.26
Chicago W13	9.24
Crawfordsville,Ind. M8	8.88
Donora,Pa. A7	8.78
Duluth A7	8.78
Fairfield,Ala. T2	8.78
Houston S5	10.51
Jacksonville,Fla. M8	8.88
Johnstown,Pa. B2	8.78
Joliet,Ill. A7	8.78
KansasCity,Mo. S5	10.51
Kokomo,Ind. C16	8.88
LosAngeles B3	9.44
Minnequa,Colo. C10	9.02
Pittsburg,Calif. C11	9.44
S.Chicago,Ill. R2	8.78
S.SanFrancisco C10	9.91
SparrowsPt.,Md. B2	8.88
Sterling,Ill.(37) N15	8.88

Coil No. 6500 Stand.

AlabamaCity,Ala. R2	$9.06
Atlanta A11	10.70
Bartonville,Ill. K4	9.16
Buffalo W12	10.60
Chicago W13	9.54
Crawfordsville,Ind. M8	9.16
Donora,Pa. A7	9.06
Duluth A7	9.06
Fairfield,Ala. T2	9.06
Houston S5	10.85
Jacksonville,Fla. M8	9.16
Johnstown,Pa. B2	9.06
Joliet,Ill. A7	9.06
KansasCity,Mo. S5	10.85
Kokomo,Ind. C16	9.16
LosAngeles B3	9.75
Minnequa,Colo. C10	9.30
Pittsburg,Calif. C11	9.75
S.Chicago,Ill. R2	9.06
S.SanFrancisco C10	10.26
SparrowsPt.,Md. B2	9.16
Sterling,Ill.(37) N15	9.16

Coil No. 6500 Interim

AlabamaCity,Ala. R2	$9.11
Atlanta A11	10.75
Bartonville,Ill. K4	9.21
Buffalo W12	10.65
Chicago W13	9.59
Crawfordsville,Ind. M8	9.21
Donora,Pa. A7	9.11
Duluth A7	9.11
Fairfield,Ala. T2	9.11
Houston S5	10.90
Jacksonville,Fla. M8	9.21
Johnstown,Pa. B2	9.11
Joliet,Ill. A7	9.11
KansasCity,Mo. S5	10.96
Kokomo,Ind. C16	9.21
LosAngeles B3	9.80
Minnequa,Colo. C10	9.35
Pittsburg,Calif. C11	9.80
S.Chicago,Ill. R2	9.11
S.SanFrancisco C10	10.31
SparrowsPt.,Md. B2	9.21
Sterling,Ill.(37) N15	9.21

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	212
Atlanta A11	212
Bartonville,Ill. K4	214
Crawfordsville,Ind. M8	214
Donora,Pa. A7	212
Duluth A7	212
Fairfield,Ala. T2	212
Houston S5	217
Jacksonville,Fla. M8	214
Joliet,Ill. A7	212
KansasCity,Mo. S5	217
Kokomo,Ind. C16	214
Minnequa, Colo. C10	217
SparrowsPt.,Md. B2	214
Sterling,Ill.(7) N15	214

FENCE POSTS

	Col.
Birmingham C15	177
Chicago Hts.,Ill. C2, I-2	177
Duluth A7	177
Franklin,Pa. F5	177
Johnstown,Pa. B2	177
Marion,O. P11	177
Minnequa,Colo. C10	182
Tonawanda,N.Y. B12	177

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	.193**
Aliquippa,Pa. J5	.190§
Atlanta A11	.197*
Bartonville,Ill. K4	.199
Crawfordsville,Ind. M8	.198
Donora,Pa. A7	.193†
Duluth A7	.193†
Fairfield,Ala. T2	.193†
Houston S5	.198**
Jacksonville,Fla. M8	.198
Johnstown,Pa. B2	.196§
Joliet,Ill. A7	.193†
KansasCity,Mo. S5	.198**
Kokomo,Ind. C16	.195†
Minnequa,Colo. C10	.198**
Monessen, Pa. P7	.196§
Pittsburg,Calif. C11	.213†
Rankin,Pa. A7	.193†
S.Chicago,Ill. R2	.193**
SparrowsPoint,Md. B2	.198§
Sterling,Ill.(7) N15	.198

WIRE (16 gage)

	An'ld Stone	Galv. Stone
Ala.City,Ala.R2	17.85	19.40**
All'ppa,Pa. J5	17.85	19.65
Bartonville K4	17.95	19.80
Chicago W13	17.85	----
Cleveland A7	17.85	----
Craw'sville M8	17.95	19.80‡‡
Fostoria,O. S1	18.35	19.90†
Houston S5	18.10	19.65**
Jacksonville M8	18.95	19.80‡‡
Johnstown B2	17.85	19.65§
Kan.City,Mo. S5	18.10	----
Kokomo C16	17.95	19.50†
Minnequa C10.	18.10	19.65**
P'lm'r,Mass.W12	18.15	19.70†
Pitts.,Calif. C11	18.20	19.75†
S.SanFran. C10	18.20	19.75**
St'ling(37) N15	17.95	19.80
SparrowsPt. B2	17.95	19.75§
Waukegan A7	17.85	19.40†
Worcester A7	18.15	----

WOVEN FENCE, 9-15 Ga. Col.

Ala.City, Ala. R2	.187**
Aliq'ppa,Pa.9-11½ga.J5	190§
Atlanta A11	.191*
Bartonville,Ill. K4	.193
Crawfordsville,Ind. M8	.192
Donora,Pa. A7	.187†
Duluth A7	.187†
Fairfield,Ala. T2	.187†
Houston S5	.192**
Jacksonville,Fla. M8	.192
Johnstown,Pa.(42) B2	.190§
Joliet,Ill. A7	.187†
KansasCity,Mo. S5	.192**
Kokomo,Ind. C16	.189†
Minnequa,Colo. C10	.192**
Pittsburg,Calif. C11	.210†
Rankin,Pa. A1	.187†
S.Chicago,Ill. R2	.187**
Sterling,Ill.(7) N15	.192

WIRE, Merchant Quality (6 to 8 gage)

	An'ld	Galv.
Ala.City,Ala. R2	9.00	9.55**
Aliquippa J5	8.65	9.325§
Atlanta (48) A11	9.00	9.75*
Bartonville(48)K4	9.85	19.90
Buffalo W12	9.00	9.55†
Chicago W13	9.00	9.55**
Cleveland A7	9.00	----
Crawfordsville M8	9.10	9.80††
Donora,Pa. A7	9.00	9.55†
Duluth A7	9.00	9.55†
Fairfield T2	9.00	9.55†
Houston(48) S5	9.25	9.80**
Jack'ville,Fla. M8	9.10	9.80††
Johnstown(48) B2	9.00	9.675§
Joliet,Ill. A7	9.00	9.55†
KansasCity(48)S5	9.25	9.80**
Kokomo(48) S16	9.10	9.65†
LosAngeles B3	9.95	10.625§
Minnequa C10	9.25	9.80**
Monessen(48) P7	8.65	9.35§
Palmer,Mass. W12	9.30	9.85†
Pitts.,Calif. C11	9.95	10.50†
Rankin,Pa. A7	9.00	9.55†
S.Chicago R2	9.00	9.55**
S.SanFran. C10	9.95	10.50**
Spar'wsPt.(48)B2	9.10	9.775§
St'ling(37)(48)N15	9.10	9.80
Struthers,O. Y1	9.00	9.65†
Worcester,Mass.A7	9.30	9.85†

Based on zinc prices of: *13.50c. †5c. §10c. ‡Less than 10c. ††10.50c. ‡‡11.00c. **Subject to zinc equalization extras.

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.

Structural ½ in., larger 12.85

7/16 in. and smaller by 6 in. and shorter: 15% off list.

FASTENERS

(Consumer discounts per cent off list prices, orders for 1 container for assorted sizes; for less than container quantities, add 25 per cent; attaching nuts to bolts, package sizes, add 7.5 per cent; heavy hex nut 1⅛ in. through 1½ in. tapped 8 threads, add 10 per cent)

HEX HEAD CAP SCREWS, coarse, or fine thread, packaged or bulk, with or without hex nuts, 1020 steel bright and high carbon heat treated, ¼ in. thru 1 in. diam., listed lengths:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
Bulk	50

BOLTS, Standard stock sizes:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
*Bulk	50

*Hot galvanized or zinc plated lag bolts only — for package or bulk quantities use applicable list less bulk discounts.

CAP AND SETSCREWS,

Fillister Head, Cap Screws, Coarse Thread:

Packaged	+55
Bulk	+16

Flat Head Cap Screws: ¾ in. and smaller, 6 in. and shorter:

Packaged	+85
Bulk	+38

Setscrews, Square Head, Cup Point, Coarse Thread: Through 1 in. diam., 6 in. and shorter:

Packaged	+ 5
Bulk	19

Through 1 in. diam., longer than 6 in.:

Packaged	+29

HEXAGON NUTS: American Standard: Finished hex, hex jam, and hex slotted coarse or fine thread, ¼ in. through 3 in., finished hex thick, thick and slotted, castle, fine thread, ¼ in. through 1½ in., semifinished hex heavy, heavy and jam, heavy and slotted, coarse thread, ¼ in. through 4 in., and

SQUARE NUTS, American Standard: Regular square and heavy square, coarse thread, ¼ in. through 2 in.:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	43.75
Bulk	50

PRESTRESSED STRAND

(High strength, stress relieved; 7 wire uncoated. Net prices per 1000 ft, 40,000 lb and over)

	Standard Diameter, Inches				
	1/4	5/16	3/8	7/16	1/2
Buffalo W12	$26.20	$38.50	$47.90	$61.30	$80.30
KansasCity,Mo. U3	26.20	38.50	47.90	61.30	80.30
Minnequa,Colo. C10	26.20	38.50	47.00	61.30	80.30
Pittsburg,Calif. C11	26.20	38.50	47.90	61.30	80.30
Roebling,N.J. R5	26.20	38.50	47.90	61.30	80.30
SparrowsPoint,Md. B2	26.20	38.50	47.90	61.30	80.30
St.Louis L8	26.20	38.50	47.90	61.30	80.30
Waukegan,Ill. A7	26.20	38.50	47.90	61.30	80.30

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut length 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	27.24	23.13
1¼	13	....	32.25	24.41
1½	13	30.42	35.66	26.98
1¾	13	35.94	42.12	31.89
2	13	40.28	47.21	35.74
2¼	13	45.36	53.17	40.26
2¼	12	49.24	57.72	43.70
2½	12	54.23	63.57	48.13
2¾	12	58.73	68.83	52.13
3	12	62.62	73.40	55.59

RAILWAY MATERIALS

Rails	Standard No. 1	Standard No. 2	Standard All No. 2	Tee Rails 60 lb Under
Bessemer,Pa. U5	5.75	5.65	....	6.725
Ensley,Ala. T2	5.75	5.65	....	6.725
Fairfield,Ala T2	....	....	....	6.725
Gary,Ind. U5	5.75	5.65	....	....
Huntington,W.Va. C15	....	....	....	6.725
Johnstown,Pa. B2	....	....	....(16)	6.725
Lackawanna,N.Y. B2	5.75	5.65	....	6.725
Minnequa,Colo. C10	5.75	5.65	....	7.225
Steelton,Pa. B2	5.75	5.65	....	....
Williamsport,Pa. S19	....	....	....	6.725

TIE PLATES

Fairfield,Ala. T2	6.875
Gary,Ind. U5	6.875
Lackawanna,N.Y. B2	6.875
Minnequa,Colo. C10	6.875
Seattle B3	7.025
Steelton,Pa. B2	6.875
Torrance,Calif. C11	7.025

JOINT BARS

Bessemer,Pa. U5	7.25
Fairfield,Ala. T2	7.25
Joliet,Ill. U5	7.25
Lackawanna,N.Y. B2	7.25
Minnequa,Colo. C10	7.25
Steelton,Pa. B2	7.25

AXLES

Ind.Harbor,Ind. S13	9.125
Johnstown,Pa. B2	9.125

SCREW SPIKES

Lebanon,Pa. B2	15.10

TRACK BOLTS, Untreated

Cleveland R2	15.35
KansasCity,Mo. S5	15.35
Lebanon,Pa. B2	15.35
Minnequa,Colo. C10	15.35
Pittsburgh S44	15.35
Seattle B3	15.85

STANDARD TRACK SPIKES

Fairfield,Ala. T2	10.10
Ind.Harbor,Ind. I-2, Y1	10.10
KansasCity,Mo. S5	10.10
Lebanon,Pa. B2	10.10
Minnequa,Colo. C10	10.10
Pittsburgh J5	10.10
Seattle B3	10.60
S.Chicago,Ill. R2	10.10
Struthers,O. Y1	10.10
Youngstown R2	10.10

Footnotes

(1) Chicago base.
(2) Double galvanized.
(3) Merchant.
(4) Reinforcing.
(5) 1½ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in.; 6.70c; 1 15/16 to 8 in., inclusive, 7.05c.
(6) Limited analyses only.
(7) Chicago base 2 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Bethany A coating.
(12) Worcester, Mass., base.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill bands.
(26) Del. in mill zone, 5.65c.
(27) Bar mill sizes.
(28) Bonderized.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝ in.; 7.375c, for widths ⅝ in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) 14 Ga., 48 in.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 13 Ga. & lighter; 60" & narrower.
(39) 48" and narrower.
(43) 9-14½ Ga.
(44) To fabricators.
(48) 6-7 Ga.
(49) 3½ in. and smaller rounds and 2½ in. and smaller hexagons; 9.65c for larger rounds and hexagons and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Ambridge, Pa. N2	+12.25	....	+5.75	....	+3.25	....	+1.75	....	+1.75	....	+2	....	0.5	....
Lorain, O. N3	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Youngstown Y1	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

ELECTRICWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Alton, Ill. L1	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Benwood, W. Va. W10	1.5	+27	+10.5	+36	+21	+45.5	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Butler, Pa. F6	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Fairless, Pa. N3	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Fontana, Calif. K1	....	....	....	....	....	....	+10.75	+28	+7.75	+24	+4.25	+19.5	+1.75	+18.25
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	1.25	+16	4.25	+12	7.75	+7.5	10.25	+6.25
Lorain, O. N3	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sharon, Pa. S4	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sparrows Pt., Md. B2	2.5	+26	+10.5	+36	+21.5	+46	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Wheatland, Pa. W9	4.5	+24	+8.5	+34	+19.5	+44	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Youngstown R2, Y1	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.75		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Alton, Ill. L1	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Benwood, W. Va. W10	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Etna, Pa. N2	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Fairless, Pa. N3	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Fontana, Calif. K1	+1.25	+17.25	+0.75	+16.75	0.75	+16.5	0.75	+16.5	+9.75	+27.5	+9.75	+27.5
Indiana Harbor, Ind. Y1	10.75	+5.25	11.25	+4.75	12.75	+4.5	12.75	+4.5	2.25	+15.5	2.25	+15.5
Lorain, O. N3	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	....	....	....	....
Sharon, Pa. M6	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	....	....	....	....
Sparrows Pt., Md. B2	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Wheatland, Pa. W9	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Youngstown R2, Y1	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5

*Galvanized pipe discounts based on price of zinc at 12.00s, East St. Louis.

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling— Ingot	Slabs	Forging Billets	H.R. Strip	H.R. Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	22.75	25.00	....	36.00	....	43.50	39.25	48.50	45.00
202	24.75	28.25	37.75	39.00	42.25	44.50	40.00	49.25	49.25
301	24.00	26.00	38.75	37.25	43.50	46.00	41.25	51.25	47.50
302	26.25	29.50	39.50	40.50	44.25	46.75	42.25	52.00	52.00
302B	26.50	30.75	42.25	45.75	46.75	49.00	44.50	57.00	57.00
303	....	33.25	42.50	....	47.25	49.75	45.00	56.75	56.75
304	28.00	29.50	39.50	40.50	44.25	46.75	45.75	52.00	52.00
304L	....	37.25	47.25	48.25	52.00	54.50	53.50	59.75	59.75
305	29.50	34.75	44.00	47.50	47.00	49.50	46.25	58.75	58.75
308	32.00	36.25	49.00	50.25	54.75	57.75	55.25	63.00	63.00
309	41.25	47.50	60.00	64.50	66.25	69.50	66.00	80.50	80.50
310	51.50	59.50	81.00	84.25	89.75	94.50	87.75	96.75	96.75
314	....	....	80.50	....	89.75	94.50	87.75	....	104.25
316	41.25	47.50	64.50	68.50	71.75	75.75	71.75	80.75	80.75
316L	....	55.25	72.25	76.25	79.50	83.50	79.50	88.50	88.50
317	49.75	58.00	79.75	88.25	89.50	94.25	88.50	101.00	101.00
321	33.50	38.00	48.75	53.50	54.50	57.50	54.75	65.50	65.50
330	....	....	123.25	....	98.75	143.75	135.00	149.25	149.25
18-8 CbTa	38.50	48.25	57.75	63.50	63.75	67.25	64.75	79.25	79.25
403	....	....	29.25	....	33.25	35.00	30.00	40.25	40.25
405	20.25	26.50	30.75	36.00	34.75	36.50	32.50	46.75	46.75
410	17.50	19.50	29.25	31.00	33.25	35.00	30.00	40.25	40.25
416	....	....	29.75	....	33.75	35.50	31.25	48.25	48.25
420	....	31.50	35.50	41.75	40.75	42.75	40.25	62.00	62.00
430	17.75	19.75	29.75	32.00	33.75	35.50	31.00	40.75	40.75
430F	....	....	30.50	....	34.25	36.00	31.75	51.75	51.75
431	....	29.75	39.25	....	43.50	46.00	41.00	56.00	56.00
446	....	....	40.75	59.00	46.00	48.25	42.75	70.00	70.00

Producers Are: Allegheny Ludlum Steel Corp.; American Steel & Wire Div., U. S. Steel Corp.; Anchor Drawn Steel Co., division of Vanadium-Alloys Steel Co.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; A. M. Byers Co.; Calstrip Steel Corp.; G. O. Carlson Inc.; Carpenter Steel Co.; Carpenter Steel Co. of New England; Charter Wire Products; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Firth Sterling Inc.; Fort Wayne Metals Inc.; Green River Steel Corp., subsidiary of Jessop Steel Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Ellwood Ivins Steel Tube Works Inc.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Stainless & Strip Div., Jones & Laughlin Steel Corp.; Joslyn Stainless Steels, division of Joslyn Mfg. & Supply Co.; Latrobe Steel Co.; Lukens Steel Co.; Maryland Fine & Specialty Wire Co. Inc.; McLouth Steel Corp.; Metal Forming Corp.; Midvale-Heppenstall Co.; National Standard Co.; National Tube Div., U. S. Steel Corp.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Riverside-Alloy Metal Div., H. K. Porter Company Inc.; Rodney Metals Inc.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Somers Brass Co.; Specialty Wire Co. Inc.; Standard Tube Co.; Superior Steel Div., Copperweld Steel Co.; Superior Tube Co.; Swepco Tube Corp.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co., subsidiary of Crucible Steel Co. of America; Tube Methods Inc.; Ulbrich Stainless Steel Inc.; Union Steel Corp.; U. S. Steel Corp.; Universal Cyclops Steel Corp.; Vanadium-Alloys Steel Co.; Wall Tube & Metal Products Co.; Wallingford Steel, subsidiary of Allegheny Ludlum Steel Corp.; Washington Steel Corp.; Seymour Mfg. Co.

Clad Steel

	Plates 5%	Plates Carbon Base 10%	Plates Carbon Base 15%	Plates Carbon Base 20%	Sheets Carbon Base 20%
Stainless					
302	....	....	....	....	37.50
304	26.05	28.80	31.55	34.30	39.75
304L	30.50	33.75	36.95	40.15	....
316	38.20	42.20	46.25	50.25	58.25
316L	42.30	46.75	51.20	55.65	....
316 Cb	49.90	55.15	60.40	65.65	....
321	31.20	34.50	37.75	41.05	47.25
347	36.90	40.80	44.65	48.55	57.00
405	22.25	24.60	26.90	29.25	....
410	20.55	22.70	24.85	27.00	....
430	21.20	23.45	25.65	27.90	....
Inconel	49.80	61.35	72.80	84.40	....
Nickel	43.20	55.05	66.95	78.90	....
Nickel, Low Carbon	43.50	55.70	67.95	80.35	....
Monel	44.25	55.35	66.45	77.60	....

	Strip, Carbon Base —Cold Rolled— 10%	Both Sides
Copper*	36.10	43.00

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. P4; Coatesville, Pa. L7; New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Reg. Carbon (W-1)	0.330	Hi-Carbon-Cr (D-11)	0.955
Spec. Carbon (W-1)	0.385	V-Cr Hot Work (H-13)	0.550
Oil Hardening (O-1)	0.505	W-Cr Hot Work (H-12)	0.530
V-Cr Hot Work (H-11)	0.505	W Hot Wk (H-21)	1.425-1.44

Grade by Analysis (%) W	Cr	V	Co	Mo	AISI Designation	$ per lb
18	4	1	....	...	T-1	1.840
18	4	2	....	...	T-2	2.005
13.5	4	3	....	...	T-3	2.105
18.25	4.25	1	4.75	...	T-4	2.545
18	4	2	9	...	T-5	2.915
20.25	4.25	1.6	12.95	...	T-6	4.330
13.75	3.75	2	5	...	T-8	2.485
1.5	4	1	....	8.5	M-1	1.200
6.4	4.5	1.9	....	5	M-2	1.345
6	4	3	....	6	M-3	1.590

Tool steel producers include: A4, A8, B2, B8, C4, C9, C12, C18, F2, J3, L3, M14, S8, U4, V2, and V3.

Pig Iron

Prices in dollars per gross ton, f.o.b. (rail) furnace; add 50 cents when shipped by truck. Maximum delivered prices are approximate and based on rail shipment.

Birmingham District	Basic	No. 2 Foundry	Malleable	Bessemer
Birmingham R2	62.00	62.50**	66.50	....
Birmingham U6	....	62.50**	66.50	....
Woodward, Ala. W15	62.00*	62.50**	66.50	....
Cincinnati, deld.	....	70.20	....	....
Buffalo District				
Buffalo H1, R2	66.00	66.50	67.00	67.50
N. Tonawanda, N.Y. T9	....	66.50	67.00	67.50
Tonawanda, N.Y. W12	66.00	66.50	67.00	67.50
Boston, deld.	77.29	77.79	78.29	....
Rochester, N.Y., deld.	69.02	69.52	70.02	....
Syracuse, N.Y., deld.	70.12	70.62	71.12	....
Chicago District				
Chicago I-3	66.00	66.50	66.50	67.00
S. Chicago R2	66.00	66.50	66.50	67.00
S. Chicago, Ill. W14	66.00	....	66.50	67.00
Milwaukee, deld.	68.81	69.31	69.31	69.81
Muskegon, Mich., deld.	....	74.46	74.46	....
Cleveland District				
Cleveland R2, A7	66.00	66.50	66.50	67.00
Akron, Ohio, deld.	69.52	70.02	70.02	70.52
Mid-Atlantic District				
Birdsboro, Pa. B10	68.00	68.50	69.00	69.50
Chester, Pa. P4	Nom.	Nom.	Nom.	....
Swedeland, Pa. A3	68.00	68.50	69.00	69.50
NewYork, deld.	....	75.41	75.91	....
Newark, N.J., deld.	72.53	73.03	73.53	74.03
Philadelphia, deld.	70.18	70.68	71.18	71.68
Troy, N.Y., R2	68.00	68.50	69.00	69.50
Boston, deld.	75.20	75.70	76.20	76.70
Pittsburgh District				
Neville Island, Pa. P6	66.00	66.50	66.50	67.00
Pittsburgh (N&S sides), deld.	....	68.31	68.31	68.81
Monaca, Pa., deld.	....	68.33	68.33	68.83
Lawrenceville, W. Homestead, Wilmerding, Pa., deld.	....	68.68	68.68	69.18
Verona, Trafford, Pa., deld.	68.83	69.33	69.33	69.83
Brackenridge, Pa., deld.	69.16	69.66	69.66	70.16
Midland, Pa. C13	66.00	....	....	....
Youngstown District				
Hubbard, Ohio Y1	....	....	66.50	....
Sharpsville, Pa. S6	66.00	....	66.50	67.00
Youngstown Y1	....	....	66.50	....

Other U. S. Districts	Basic	No. 2 Foundry	Malleable	Bessemer
Duluth I-3	66.00	66.50	66.50	67.00
Erie, Pa. I-3	66.00	66.50	66.50	67.00
Fontana, Calif. K1	75.00	75.50	....	....
Geneva, Utah C11	66.00	66.50	....	....
GraniteCity, Ill. G4	67.90	68.40	68.90	....
Ironton, Utah C11	66.00	66.50	....	....
Minnequa, Colo. C10	68.00	68.50	69.00	....
Rockwood, Tenn. T3	62.00	62.50‡	66.50	67.00
Toledo, Ohio I-3	66.00	66.50	66.50	67.00
Cincinnati, deld.	72.94	73.44	....	....
Mansfield, Ohio, deld.	....	....	71.34	....
Canadian District				
Hamilton, Ont. S46	65.00	65.00	65.50	....
PortColborne, Ont. A25	65.00	65.00	65.50	66.00
SaultSte. Marie, Ont. A25	65.00	65.00	65.50	66.00

*Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.
**Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.50.
‡Phos. 0.50% up; Phos. 0.30-0.49%, $63.50.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.01-6.50% silicon; add 75c for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 13%; starting with silicon over 13% add $1 per ton for each 0.50% silicon or portion thereof up to 14%; over 14%, price is $93 with $1 differential; add $1 for each 0.50% Mn over 1%)

Buffalo H1	$79.25
Jackson, Ohio I-3, J1	78.00
PortColborne, Ont. A25	78.50
Toledo, Ohio I-3	78.00

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity, Ky. P15	$99.00
NiagaraFalls, N.Y. P15	99.00
Keokuk, Iowa Open-hearth & Fdry. K2	89.00
Keokuk, Iowa O.H. & Fdry. 12½ lb piglets, 16% Si, K2	92.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Birdsboro, Pa. B10 (Phos. 0.075% max)	$73.00
Lyles, Tenn. T3 (Phos. 0.035% max)	73.00
Rockwood, Tenn. T3 (Phos. 0.035% max)	73.00
Buffalo H1 (Intermediate) (0.036-0.075% max)	71.50
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Erie, Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
NevilleIsland, Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Swedeland, Pa. A3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Troy, N.Y. R2 (Phos. 0.075% max)	73.00

Steel Service Center Products

Representative prices, cents per pound, f.o.b. warehouse, for 2000 lb items (except stainless) ordered by themselves. Prices will vary with total weight of the order or weight of the individual items or both. Base quantities for stainless sheets: 8000 lb, except in Chicago, New York, Boston, Los Angeles, and San Francisco, 10,000 lb. City delivery charges are 15 cents per 100 lb except: Denver, 20 cents; Baltimore, Boston, New York, Philadelphia, San Francisco, 10 cents; Atlanta, Birmingham, Dallas, Houston, Los Angeles, Seattle, no charge.

	SHEETS				STRIP	BARS			STRUCTURAL	PLATES	
	Hot Rolled	Cold Rolled	Galv.	Stainless Type 302	Hot Rolled	H.R. Rounds	C.F. Rounds	H.R. Alloy 4140	SHAPES	Carbon	Floor
Atlanta	9.37	10.61	11.83	....	10.85	9.53	13.24	....	9.94	9.73	11.16
Baltimore	7.77	9.61	10.06	....	10.18	8.55	11.70	16.38	9.03	8.34	10.02
Birmingham	9.43	10.20	10.46	....	10.41	8.26	13.14	16.76	8.47	8.41	10.05
Boston	9.67	10.58	11.77	53.50	12.16	9.77	13.35	16.59	10.16	9.62	11.08
Buffalo	8.55	9.30	11.25	55.98	11.00	8.75	11.45	16.30	9.15	8.65	11.10
Charlotte, N. C.	9.87	11.22	10.30	....	10.86	9.67	12.68	....	9.88	9.82	11.46
Chicago	8.57	10.20	10.15	52.00	10.74	8.55	10.65	15.95	8.91	8.41	10.68
Cincinnati	9.34	10.26	10.75	65.30	11.71	9.33	11.53	16.27	10.14	9.44	11.68
Cleveland	8.57	9.98	10.92	56.18	10.86	8.66	11.25	16.66	9.30	8.65	10.92
Dallas	9.62	10.05	11.75	....	10.57	9.03	12.98	16.95	9.26	9.35	11.97
Detroit	9.48	10.46	11.05	52.00	11.76	9.53	11.01	16.23	10.14	9.43	11.61
Denver	9.41	11.77	12.11	....	9.86	10.10	11.47	....	10.62	9.69	11.83
Houston	9.22	9.65	11.35	52.90	10.78	8.63	13.10	16.55	8.86	8.95	10.60
Indianapolis	9.66	10.64	11.14	....	11.83	9.66	11.09	16.39	10.01	9.50	11.79
Kansas City	9.21	10.87	11.35	....	10.87	9.31	11.57	15.72	9.80	9.10	....
Los Angeles	9.50	11.20	12.20	61.27	11.20	9.55	14.20	17.35	10.45	9.70	11.70
Memphis, Tenn.	8.98	10.05	....	....	10.64	8.82	12.74	....	9.01	8.66	11.41
Milwaukee	8.71	10.34	10.29	....	10.88	8.69	10.89	16.09	9.13	8.55	10.82
Moline, Ill.	8.92	10.55	10.50	....	11.09	8.90	11.00	16.30	9.26	8.76	11.03
Newark, N. J.	9.36	10.13	11.35	....	11.46	9.74	13.25	16.40	10.20	9.51	11.05
New York	9.36	10.13	11.35	52.98	11.46	9.74	13.25	16.40	10.20	9.51	11.00
Philadelphia	8.35	9.60	10.66	52.71	10.35	8.75	11.95	16.38	8.95	8.70	9.95
Pittsburgh	8.57	9.98	11.13	52.00	10.84	8.55	11.25	15.95	8.91	8.41	10.68
Portland, Oreg.	9.45	11.30	12.35	....	11.45	9.45	16.65	17.80	10.05	9.60	11.75
St. Louis	8.77	10.53	11.08	....	10.94	8.77	11.28	16.33	9.14	8.77	10.91
St. Paul	8.84	9.69	10.84	....	11.01	8.82	11.49	16.54	9.18	8.68	10.95
San Francisco	10.17	11.69	11.40	54.00	11.78	10.07	15.10	17.25	10.49	10.38	12.47
Seattle	10.51	11.57	12.50	54.02	11.95	9.94	16.20	17.80	10.65	10.10	12.73
Spokane, Wash.	10.36	11.42	12.35	54.02	11.80	9.79	16.20	17.85	10.50	9.95	12.58

Specifications: Hot rolled sheet, sheared edge, 10 Ga. & 36 x 96-120 in.; cold rolled sheets, 20 Ga. & 36 x 96-120 in.; galvanized sheets, 10 Ga. x 36 x 120 in. except Los Angeles, Dallas and Houston, 10 Ga. x 48 x 120 in.; stainless, 16 Ga. & 36 in.; hot rolled strip, ¼ in. x 1 in.; hot rolled carbon bars, rounds, ¾ in.—1¼ in., M1020; cold finished bars, 1 in., C1018; hot rolled alloy bars, 4140 annealed, 1⅝ in.—2⅞ in. rounds; structural shapes, I beams, 6 x 12½ in.; carbon plates, sheared, through ½ in. x 84 in.; floor plates, ¼ in. x 36 in.

Refractories

Fire Clay Brick (per 1000 pieces*)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Winburne, Snow Shoe, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parrall, Portsmouth, Ohio, Ottawa, Ill., Stevens Pottery, Ga., Canon City, Colo., $140; Salina, Pa., $145; Niles, Ohio, $146; Cutler, Utah, $175.

Super-Duty: Ironton, Ohio, Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Winburne, Snow Shoe, Pa., New Savage, Md., St. Louis, $185; Stevens Pottery, Ga., $195; Cutler, Utah, $248.

Silica Brick (per 1000 pieces*)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Ft. Matilda, Pa., Portsmouth, Ohio, Hawstone, Pa., St. Louis, $158; Warren, Niles, Windham, Ohio, Hays, Latrobe, Morrisville, Pa., $163; E. Chicago, Ind., Joliet, Rockdale, Ill., $168; Canon City, Colo., $173; Lehi, Utah, $183; Los Angeles, $185.

Super-Duty: Sproul, Hawstone, Pa., Niles, Warren, Windham, Ohio, Leslie, Md., Athens, Tex., $158; Morrisville, Hays, Latrobe, Pa., $163; E. Chicago, Ind., St. Louis, $168; Canon City, Colo., $183; Curtner, Calif., $185.

Semisilica Brick (per 1000 pieces*)

Woodbridge, N. J., Canon City, Colo., $140; Philadelphia, Clearfield, Pa., $145.

Ladle Brick (per 1000 pieces*)

Dry-Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Pa., Vandalia, Mo., New Salisbury, Ohio, $97; Vanport, Pa., Wellsville, Irondale, Ohio, $100; Clearfield, Pa., Portsmouth, Ohio, $102; St. Louis, Mexico, Mo., $120.

High-Alumina Brick (per 1000 pieces*)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., Danville, Ill., $250; Philadelphia, $265; Clearfield, Pa., $230; Orviston, Snow Shoe, Pa., $260.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $310; Danville, Ill., $313; Clearfield, Orviston, Snow Shoe, Pa., $320; Philadelphia, $325.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $350; Danville, Ill., $353; Clearfield, Orviston, Snow Shoe, Pa., $360; Philadelphia, $365.

Sleeves (per 1000)

St. Louis, $193; Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., $188; Ottawa, Ill., $205.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., St. Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Clearfield, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, Gibsonburg, Narlo, Ohio, $16.75; Thornton, McCook, Ill., $17; Dolly Siding, Bonne Terre, Mo., $15.00.

Magnesite (per net ton)

Domestic, dead-burned, ½ in. grains with fines: Chewelah, Wash., Luning, Nev., $46; ¾ in. grains with fines: Baltimore (periclase), $73; Pascagoula, Miss. (periclase), $90.

*—9 in. x 4½ x 2.50 straights.

Ores

Lake Superior Iron Ore

(Prices effective for the 1960 shipping season, subject to later revision, gross ton, 51.50% iron natural, rail of vessel, lower lake ports.)

Mesabi bessemer	$11.60
Lump ⅛ in. and up	12.85
Fines, under ⅛ in.	10.72
Mesabi nonbessemer	11.45
Old Range bessemer	11.85
Old Range nonbessemer	11.70
Open-hearth lump	12.70
High phos.	11.45

Based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 1. 1960; increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

New Jersey, concentrates ..... nom.

Foreign Iron Ore

Cents per unit

Swedish basic, 65%, c.i.f. Atlantic ports	25.00†
Chilean, 62-65%, c.i.f. Atlantic ports	22.00
Brazilian, 68.5% f.o.b. vessel, Victoria, per ton	$11.50

Tungsten Ore

Net ton, unit

Foreign wolframite, good commercial quality	$19.00-19.50*
Domestic, concentrates, f.o.b. milling points	22.00-23.00

Manganese Ore

Mn 46-58%, Indian, 85-90c, nom. per long ton unit, c.i.f. U. S. ports, duty for buyer's account.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charlestown, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian

48% 3:1	$34.00-35.00†
48% no ratio	25.00-26.00†

South African Transvaal

44% no ratio	18.75
48% no ratio	24.00-26.00†

Turkish

48% 3:1	35.00-37.00†

Domestic

Rail nearest seller

18% 3:1	30.00

Molybdenum

Sulfide concentrate, per lb of Mo content, mines, unpacked $1.23

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard

55-60%	$2.70-3.20
60-65%	3.25-3.45

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

*Before duty. †Nominal.

Canadian Steel

(Cents per lb, f.o.b. mill, except as otherwise noted)

Billets, Blooms & Slabs:	
Carbon (N.T.):	
Forging	$97.00
Rerolling	78.00
Alloy (N.T.)	115.00
Wire Rods:	
Carbon	5.70
Alloy	6.40
Wire (carload lots):	
Merchant annealed	8.40
Low carbon indus.	7.20
Upholstery spring	8.55
M.B. spring	8.85
Bars & Small Shapes:	
Carbon, merchant	5.30
Carbon, special	5.85
Alloy	6.40
Bar Mill Bands:	
Carbon	5.40
Alloy	8.05
Bars, Reinforcing	5.30
Structural Shapes:	
Standard carbon	5.50
Angles & zees	5.40
Plates, Carbon:	
Sheared	5.45
Universal mill	5.10
Sheets & Coils, Hot Rolled:	
Carbon sheet	4.95
Carbon strip	5.00
Sheets & Coils, Cold Rolled:	
Carbon sheet	6.35
Carbon strip:	
(0.060 and lighter)	6.35
(0.061 and heavier)	6.65
Sheets & Coils, Galvanized:	
Standard quality	6.70
Culvert quality	7.00
Sheets, Porcelain Enameling	7.45
Sheets & Coils, Electrical:	
Field grade	9.00
Armature grade	9.50
Electrical grade	10.15
Sheet Piling	6.15
Skelp	4.70
Rails, Heavy	5.55
Rails, Light	5.70
Joint Bars	6.55
Tie Plates	6.35
Grinding Balls (3 in. diam.)	7.00
Tin Mill Products	(Per base box; 100 lb base wt)
Coke tin plate (1.25 lb pot yield)	$10.60
Electrolytic tin plate (0.25 lb coating)	9.10
Black plate	8.30
Nails, Wholesale:	
Carload lots	Col. 110

Fluorspar

Metallurgical grades, f.o.b. shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-$41; 70%, $36-$40; 60%, $33-$36.50. Imported, net ton, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $30-$33, contract; Mexican, all rail, duty paid, $28-$28.50; barge, Brownsville, Tex., $30-$31.

Metal Powder

(Per pound, f.o.b. shipping point in ton lots for minus 100 mesh, except as noted.)

	Cents
Sponge Iron, domestic and foreign, 98% Fe, min. trucklots, freight allowed east of Mississippi River:	
100 mesh, bags	11.50
100 mesh, pails	9.85‡
40 mesh, bags	8.10††
Electrolytic Iron,	
Melting stock, 99.9% Fe, irreg. fragments, ⅛ in. x 1.3 in.	28.75
(In contract lots of 750 tons price is 22.75c.)	
Annealed, 99.5% Fe. ton, del. east of Mississippi.	36.75,
Unannealed (99+% Fe)	33.0
Unannealed (99+% Fe) (minus 325 mesh)	58.0
Carbonyl Iron: 90-99.9%, 3 to 20 microns, depending on grade, 88.00-700.00 in standard 200-lb containers; all minus 200 mesh.	
Aluminum: Atomized, 600-lb drum freight allowed, c.l. 39.80; ton lots	41.80
Brass, 80/20, leaded (60 mesh)	36.50
Bronze powder, 90/10.	54.20
Copper, all types	15.25*
Lead	7.50*
Manganese, minus 35 mesh	1.00
Nickel, all types	0.78-1.06
Nickel-Silver	57.90
Solder	7.50*
Stainless Steel, 304	89.00
Stainless Steel, 316	$1.07
Steel, AISI 4650	32.00
Tin	14.00*
Zinc	23.20
Cobalt:	Dollars
98.5%, minus 100-300 mesh	1.57-1.58
99.5%, below 5 microns	2.32
Tungsten	nom.
Molybdenum	4.35

*Plus cost of metal. ‡Depending on mesh. §Cutting and scarfing grades. **Depending on price of ore. ††Welding grade.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, Pa., furnace	$14.75-15.25
Connellsville, Pa., foundry	18.00-18.50

Oven Foundry

Birmingham, ovens	$30.35
Cincinnati, deld.	33.34
Buffalo, ovens	32.00
Chattanooga, Tenn., ovens	30.80
Detroit, ovens	32.00
Pontiac, Mich., deld.	34.05
Saginaw, Mich., deld.	35.63
Erie, Pa., ovens	32.00
Indianapolis, ovens	31.25
Ironton, Ohio, ovens	30.50
Cincinnati, deld.	33.64
Kearny, N. J., ovens	31.25
Milwaukee, ovens	32.00
Neville Island (Pittsburgh), Pa., ovens	30.75
New Haven, Conn., ovens	31.00
Painesville, Ohio, ovens	32.00
Cleveland, deld.	34.45
Philadelphia, ovens	31.00
St. Louis, ovens	33.00
St. Paul, ovens	31.25
Chicago, deld.	34.78
Swedeland, Pa., ovens	31.00
Terre Haute, Ind., ovens	31.25

Imported Steel

(Base per 100 lb, landed, duty paid; based on current ocean rates with any rise for buyer's acc't. Source of shipment: Western Europe)

	North Atlantic	Great Lakes	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305	$5.65	$5.90	$5.60	$5.50	$5.80
Bar Size Angles	5.85	6.10	5.80	5.70	6.00
Structural Angles	5.65	5.90	5.60	5.50	5.80
I-Beams	5.60	5.85	5.55	5.45	5.75
Channels	5.60	5.85	5.55	5.45	5.75
Plates (basic bessemer)	5.45	5.80	5.50	5.40	5.70
Sheets, hot rolled and galvanized	Nom.	....	Nom.	Nom.	Nom.
Furring Channels, C.R., 1000 ft, ¾ x 0.30 lb per ft.	25.20	24.70	24.40	24.40	25.20
Barbed Wire (†)	6.50	6.40	6.40	6.25	6.60
Merchant Bars	5.85	6.10	5.80	5.70	6.00
Hot-Rolled Bands	5.95	6.20	5.90	5.80	6.10
Wire Rods, Thomas Commercial No. 5	5.80	5.85	5.75	5.75	6.00
Wire Rods, O. H., No. 5	6.00	6.05	5.95	5.95	6.25
Bright Common Wire Nails (‡)	6.55	6.80	6.50	6.40	6.70

†Per 82 lb net reel. ‡Per 100-lb keg, 20d nails and heavier.

Coal Chemicals

(Representative prices)

Cents per gal f.o.b. tank cars or tank trucks, plant.

Pure benzene	34.00
Xylene, industrial grade	29.00
Creosote	24.00
Naphthalene, 78 deg.	6.00
Toluene, one deg. (deld. east of Rockies)	25.00

Cents per lb, f.o.b. tank cars or tank trucks, deld.

Phenol, 90 per cent grade	14.75
Per ton bulk, f.o.b. cars or trucks, plant.	
Ammonium sulfate, regular grade	$32.00

A pair of Reversing
2-High Rolling Mills
—36" and 18"—

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For two different clients, for two different jobs, but they were produced side-by-side . . . each a product of Birdsboro's broad experience . . . experience that covers the many sizes and types of rolling mills and all their variations.

Regardless of variation, one factor remains the same, each mill is the successfully combined effort of the builder and the buyer—the experienced mill designer and the user. Each offers invaluable contributions to the successful operation of the installed unit. Each points the way to profitable productivity. *Sales Department, Engineering Department and Mfg. Plant:* Birdsboro, Pa., *District Office:* Pittsburgh, Pa.

MM 81-59

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STEEL MILL MACHINERY • HYDRAULIC PRESSES • CRUSHING MACHINERY • SPECIAL MACHINERY • ROLLS • ELECTRIC STEEL CASTINGS: Carbon, Low Alloy and STAINLESS STEEL

Scrap Rises as Supplies Tighten

STEEL's composite advances $1 a ton to $33.67 as domestic mills compete with exporters for weather-shortened supplies in the East. Sluggish steel rate holds consumption down

Scrap Prices, Page 110

• **Philadelphia**—Domestic prices on open hearth scrap have advanced $2 to $3 a ton, with the mills competing with exporters for tonnage outside the immediate local area. Strength in the market has also developed because bad weather has hindered collection and processing of material.

No. 1 heavy melting steel is now quoted $39, delivered, No. 2 heavy melting $36, No. 1 bundles $40, No. 2 bundles $26, and No. 1 busheling $40. Higher prices are also quoted on electric furnace bundles at $41, short shoveling turnings at $21, machine shop turnings at $14, low phos structurals and plates at $41-$43, and wheels, couplers, and springs at $43.

• **New York**—Little domestic demand for steel scrap is noted here. However, steady export buying has not resulted in any change in brokers' buying prices on the major open hearth grades. Collections have been handicapped recently by bad weather. The market on borings and turnings is nominal, reflecting slack demand.

• **Pittsburgh** — Brokers' bids on Pennsylvania Railroad scrap were up $1 to $3 a ton from last month's figures. Railroad heavy melting scrap brought $41.16 (up $1.50), but all of it was sold for export. Local consumers should be able to obtain such material for $36, on the basis of the latest sale by Pittsburgh & Lake Erie Railroad. The market is quiet but firm.

• **Chicago**—Despite limited buying by the mills and generous inventories, scrap prices are little changed. The only pressure on the market is from export demand, and should it disappear, prices could readily slip. Steelmakers now doubt that any improvement in steel product demand will be shown in March. Steel production rose 10 per cent nationally in January.

Foundry scrap is showing increased strength which could be translated shortly into higher prices. A number of gray iron jobbing shops report an increase in orders for castings.

• **Cleveland**—Except for a few small purchases, including a tonnage of No. 1 heavy melting industrial material at $35 by a Valley mill, the market is inactive. Dealers are hoping for a spring pickup in demand from the mills. At least 20,000 tons of scrap destined for export are reported piled on docks at Lorain and Ashtabula, Ohio, awaiting the opening of navigation.

• **Detroit**—Demand is slow, but the market is steady. Only small orders are being placed, but prices seem to be firming up. It's expected that monthend auto tonnages will be smaller and push list prices higher. Some dealers think foreign brokers have purchased their scrap requirements for spring shipment, but it's expected there'll be more purchasing for overseas shipment the next few weeks.

• **Buffalo**—Strength is reported developing in cast iron scrap as a result of a local scarcity. Foundries are buying fair tonnages in the face of the limited supplies held by dealers. That is tending to firm up prices. Dealers think the next sale of cupola scrap will be made at higher prices.

Steel scrap continues unchanged with mill demand lacking. The market undertone is firm, due more to limited supplies than demand. Dealers don't expect any significant mill buying until some time during March.

• **Cincinnati**—Prices are unchanged in the absence of new buying. No. 1 heavy melting steel is quoted by brokers at $26.50-$27.50. Dealers expect little change until monthend industrial lists provide an indicator of the price trend. Demand for the foundry grades continues sluggish. With better weather, country scrap will begin moving into dealers' yards at a better rate and the supply situation will ease.

• **St. Louis**—Little tonnage is moving in this market. Even minor price changes are lacking. Snow and cold weather haven't helped the situation. Scrapmen don't expect much change in market conditions until business in general takes a turn for the better. Dealers expect to begin shipping material out of this area for export by mid-March when lower barge rates become effective.

• **Birmingham** — Prices are unchanged. While one consumer bought some 3 ft electric steel scrap last week, the tonnage was disappointing. The cast iron scrap market continues inactive with foundry operation ssluggish.

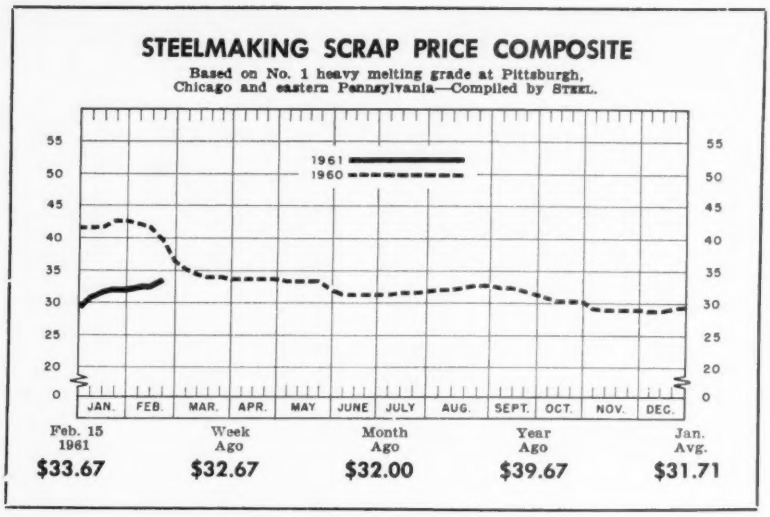
• **Houston**—Prices on several steel grades increased $1 to $2 a ton on reports that Texas steelmen expect better business soon. No. 1 heavy melting steel is now listed at $35-$36, largely on the basis of sales in the export market. But one mill is buying some specially prepared No. 2 steel. The cast iron grades are not in demand.

• **San Francisco**—Reports that the Japanese will increase their purchases of steel scrap in the second quarter are serving to inject a measure of optimism in an otherwise dull market situation. Local mills are still taking little tonnage.

• **Seattle**—Prices are up $1 to $3 a ton in this market because of: Increased mill demand, active exports, weather-limited shipments from the interior. Similar conditions are reported at Portland, Oreg.

Not much material is immediately available but supplies will pick up when the weather breaks. Mill prices on No. 1 heavy melting are reported at $38-$39, while exporters are reported to be offering $37-$38. No. 2 bundles are active at $22-$23.

Export orders for Japan are being loaded at Puget Sound and Columbia River points. Commercial Terminals Co. has leased space from the Port of Seattle for shipbreaking, and plans to scrap a Liberty ship every two months, each yielding about 3000 gross tons.



December Scrap Use Slips But So Do Users' Stocks

Ferrous scrap consumption in December, 1960, totaled 3,739,000 gross tons, down 5 per cent from the preceding month, and the lowest for any month since July, 1960, reports the U. S. Bureau of Mines. The total metallic charge (7,147,000 tons) consisted of 52 per cent scrap and 48 per cent pig iron, unchanged from November.

Domestic consumers' stocks of scrap on Dec. 31 amounted to 8,268,000 tons, 2 per cent less than on Nov. 30. At the end of 1959, stocks totaled an estimated 8,938,480 tons. Stocks of pig iron on Dec. 31 were 3,356,000 tons, up 1 per cent from the preceding month, and up almost 700,000 tons from stocks of 2,660,051 tons held on Dec. 31, 1959.

Home scrap produced during December accounted for 2,153,000 gross tons, 9 per cent less than during November. Purchased scrap received by consumers in the month totaled 1,585,000 tons, 3 per cent more than during the preceding month. Of the purchased material, 82 per cent was received from dealers, and 18 per cent from other sources.

Metallurgical Coke . . .

Metallurgical Coke Prices, Page 106

Coke production totaled 3,428,550 tons (3,376,725 oven, 51,825 beehive) in December, 1960, reports the U. S. Bureau of Mines. That compares with 3,537,680 tons (3,487,070 oven, 50,610 beehive) in November, 1960, and 6,163,300 tons (6,070,900 oven, 92,400 beehive) in December, 1959.

Production in all of 1960 amounted to 56,993,269 tons (56,043,110 oven, 950,159 beehive) vs. 55,863,572 tons (54,789,276 oven, 1,074,296 beehive) in 1959.

Producers' stocks of oven coke as of Dec. 31 totaled 4,757,579 net tons, equal to 43.7 days' output. Stocks at the end of December, 1959, were 4,672,202 tons, equal to 23.9 days' production.

Pig Iron . . .

Pig Iron Prices, Page 105

The drain on merchant pig iron stocks at some blast furnaces has reached the point where some producers are beginning to be pinched. Republic Steel Corp. is resuming operations at its Lyon Mountain iron mine (closed since Nov. 11) and at its Troy, N. Y., blast furnace (closed since Dec. 1). Both facilities reopen Feb. 27.

The resumption is attributed to a pickup in foundry orders for certain grades of merchant iron which now can't be filled from inventories. The orders are sufficient to support operations for several weeks.

Demand for most grades of iron continues to drag. The weather has adversely affected foundry operations, especially in the East. There is no particular drive for pressure and soil pipe. Railroad equipment and machine tool business also continues slow. The shutdown of many auto supplier plants is expected to reduce the demand for merchant iron because there will be less call for automotive castings.

Tubular Goods . . .

Tubular Goods Prices, Page 104

The uptrend in demand for oil country goods that started in December may be leveling off. A leading tubemaker boosted his shipments about 25 per cent in January (much of the pickup being in drill pipe). His February business started off "fairly well." A competitor, whose shipments dropped slightly in January, reports he is encouraged by signs of a pickup in buying by major oil companies.

Some oil country goods are making a better showing than others. One of the standouts is 10¾ in. casing.

Like oil country goods, standard pipe chalked up substantial gains in shipments during January. Distributors are replenishing their depleted inventories as they prepare for a spring pickup in construction.

Line pipe sales of Pittsburgh area producers have been lagging, but there are hopes for greater activity when the Federal Power Commission approves some gas transmission projects that are on drawing boards.

The latest weekly survey of the Hughes Tool Co. shows 1512 rotary oil rigs in operation in the U. S., an increase of seven from the previous survey, and the first upward turn in five weeks.

Canadian Steel Output Falls Below Record in '60

Canadian steel production in 1960 was estimated at 5.7 million tons, down about 100,000 from record 1959 output. Early in the year it looked like the industry was headed for a record as the steelmakers struggled to keep up with demand resulting from the long steel strike in the U. S. in 1959. But a recession intervened.

Overseas steel orders helped the Steel Co. of Canada and Algoma Steel Corp. Orders from Canadian customers fell after March. Stelco had sales of $281 million and profits of $21,355,651 compared with sales of $321 million and profits of $32,878,195 in 1959. The company produced 2,151,944 tons of ingots against 2,438,222 in 1959.

(*Please turn to Page* 115)

Iron and Steel Scrap

Consumer prices per gross ton, except as otherwise noted, including brokers' commission, as reported to STEEL, Feb. 15, 1961. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Feb. 15	$33.67
Feb. 8	32.67
Jan. Avg.	31.71
Feb. 1960	38.87
Feb. 1956	48.96

Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	31.00-32.00
No. 2 heavy melting	26.00-27.00
No. 1 dealer bundles	31.00-32.00
No. 2 bundles	25.00-26.00
No. 1 busheling	31.00-32.00
No. 1 factory bundles	38.00-39.00
Machine shop turnings	13.00-14.00
Mixed borings, turnings	13.00-14.00
Short turnings	17.00-18.00
Cast iron borings	17.00-18.00
Cut structurals:	
2 ft and under	34.00-35.00
3 ft and under	33.00-34.00
Heavy turnings	25.00-26.00
Punchings & plate scrap	38.00-39.00
Electric furnace bundles	38.00-39.00

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	32.00-33.00
Stove plate	29.00-30.00
Unstripped motor blocks	24.00-25.00
Clean auto cast	31.00-32.00
Drop broken machinery	44.00-45.00§

Railroad Scrap

No. 1 R.R. heavy melt.	35.00-36.00
Rails, 2 ft and under	*50.00-51.00*
Rails, 18 in. and under	*51.00-52.00*
Random rails	*44.00-45.00*
Angles, splice bars	*43.00-44.00*
Railroad specialties	*44.00-45.00*
Rails, rerolling	53.00-54.00

Stainless Steel Scrap

18-8 bundles & solids	175.00-180.00
18-8 turnings	95.00-100.00
430 bundles & solids	90.00-95.00
430 turnings	50.00-55.00

CHICAGO

No. 1 hvy melt., indus.	31.00-32.00
No. 1 hvy melt., dealer	29.00-30.00
No. 2 hvy melting	26.00-27.00
No. 1 factory bundles	35.00-36.00
No. 1 dealer bundles	29.00-30.00
No. 2 bundles	19.00-20.00
No. 1 busheling, indus.	31.00-32.00
No. 1 busheling, dealer	29.00-30.00
Machine shop turnings	14.00-15.00
Mixed borings, turnings	16.00-17.00
Shovel turnings	16.00-17.00
Cast iron borings	16.00-17.00
Cut structurals, 3 ft	*37.00-38.00*
Punchings & plate scrap	*38.00-39.00*

Cast Iron Grades

No. 1 cupola	41.00-42.00
Stove plate	*37.00-38.00*
Unstripped motor blocks	33.00-34.00
Clean auto cast	46.00-47.00
Drop broken machinery	46.00-47.00

Railroad Scrap

No. 1 R.R. heavy melt.	32.00-33.00
R.R. malleable	43.00-44.00
Rails, 2 ft and under	*47.00-48.00*
Rails, 18 in. and under	48.00-49.00
Angles, splice bars	40.00-41.00
Axles	*55.00-56.00*
Rails, rerolling	54.00-55.00

Stainless Steel Scrap

18-8 bundles, solids	165.00-175.00
18-8 turnings	90.00-95.00
430 bundles & solids	85.00-90.00
430 turnings	45.00-50.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	20.00-21.00
No. 2 heavy melting	15.00-16.00
No. 1 bundles	22.00-23.00
No. 2 bundles	12.00-13.00
No. 1 busheling	19.00-20.00
Machine shop turnings	6.00-7.00
Mixed borings, turnings	7.00-8.00
Shovel turnings	8.00-9.00

Cast Iron Grades

No. 1 cupola	29.00-30.00
Stove plate	23.00-24.00
Heavy breakable	22.00-23.00
Unstripped motor blocks	18.00-19.00
Charging box cast	24.00-25.00
Clean auto cast	35.00-36.00

CLEVELAND

No. 1 heavy melting	*29.00-30.00*
No. 2 heavy melting	19.00-20.00†
No. 1 factory bundles	35.00-36.00
No. 1 bundles	29.50-30.50
No. 2 bundles	16.00-17.00
No. 1 busheling	29.00-30.00
Machine shop turnings	10.00-11.00
Shovel turnings	14.00-15.00
Mixed borings, turnings	14.00-15.00
Cast iron borings	14.00-15.00
Cut foundry steel	31.00-32.00
Cut structurals, plate, 2 ft and under	36.00-37.00
Low phos. punchings & plate	28.00-29.00
Alloy free, short shovel turnings	14.00-15.00
Electric furnace bundles	28.00-29.00

Cast Iron Grades

No. 1 cupola	37.00-38.00
Charging box cast	24.00-25.00
Heavy breakable cast	26.00-27.00
Stove plate	34.00-35.00
Unstripped motor blocks	29.00-30.00
Brake shoes	35.00-36.00
Clean auto cast	43.00-44.00
Burnt cast	30.00-31.00
Drop broken machinery	44.00-45.00

Railroad Scrap

R. R. malleable	42.00-43.00
Rails, 2 ft and under	49.00-50.00
Rails, 18 in. and under	49.00-50.00
Rails, random lengths	41.00-42.00
Cast steel	39.00-40.00
No. 1 railroad cast	45.00-46.00
Railroad specialties	42.50-43.50
Angles, splice bars	40.50-41.50
Rails, rerolling	53.00-54.00

Stainless Steel Scrap
(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	150.00-155.00
18-8 turnings	65.00-70.00
430 clips, bundles, solids	65.00-70.00
430 turnings	10.00-20.00

YOUNGSTOWN

No. 1 heavy melting	32.00-33.00
No. 2 heavy melting	21.00-22.00
No. 1 busheling	32.00-33.00
No. 1 bundles	33.00-34.00
No. 2 bundles	20.00-21.00
Machine shop turnings	12.00-13.00
Shovel turnings	17.00-18.00
Cast iron borings	17.00-18.00
Low phos.	34.00-35.00
Electric furnace bundles	34.00-35.00

Railroad Scrap

No. 1 R.R. heavy melt.	35.00-36.00

BUFFALO

No. 1 heavy melting	27.00-28.00
No. 2 heavy melting	23.00-24.00
No. 1 bundles	27.00-28.00
No. 2 bundles	20.00-21.00
No. 1 busheling	27.00-28.00
Shovel turnings	16.00-17.00
Machine shop turnings	12.00-13.00
Cast iron borings	14.00-15.00
Low phos. structurals and plates, 2 ft and under	37.00-38.00

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	36.00-37.00
No. 1 machinery	43.00-44.00

Railroad Scrap

Rails, random lengths	40.00-41.00
Rails, 3 ft and under	46.00-47.00
Rails, rerolling	55.00-56.00
Railroad specialties	39.00-40.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	26.50-27.50
No. 2 heavy melting	24.50-25.50
No. 1 bundles	27.50-28.50
No. 2 bundles	19.00-20.00
No. 1 busheling	26.50-27.50
Machine shop turnings	10.00-11.00
Mixed borings, turnings	11.00-12.00
Shovel turnings	11.00-12.00
Cast iron borings	11.00-12.00
Low phos. 18 in.	35.00-36.00

Cast Iron Grades

No. 1 cupola	35.00-36.00
Heavy breakable cast	28.00-29.00
Charging box cast	35.00-36.00
Drop broken machinery	46.00-47.00

Railroad Scrap

No. 1 R.R. heavy melt.	30.00-31.00
Rails, 18 in. and under	44.00-45.00
Rails, random lengths	37.00-38.00

PHILADELPHIA

No. 1 heavy melting	*39.00*
No. 2 heavy melting	*36.00*
No. 1 bundles	*40.00*
No. 2 bundles	*26.00*
No. 1 busheling	*40.00*
Electric furnace bundles	*41.00*
Mixed borings, turnings	15.00
Shovel turnings	*21.00*
Machine shop turnings	*14.00*
Heavy turnings	25.00†
Structurals & plates	*41.00-43.00*
Couplers, springs, wheels	*43.00*
Rail crops, 2 ft & under	50.00-52.00

Cast Iron Grades

No. 1 cupola	38.00
Heavy breakable cast	39.00
Drop broken machinery	48.00-49.00
Malleable	46.00†

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	27.00-28.00
No. 2 heavy melting	19.00-20.00
No. 1 bundles	27.00-28.00
No. 2 bundles	16.00-17.00
Machine shop turnings	3.50-4.00†
Mixed borings, turnings	4.00-4.50†
Shovel turnings	5.00-6.00†
Low phos. structurals & plates	31.00-32.00†

Cast Iron Grades

No. 1 cupola	34.00-35.00
Unstripped motor blocks	23.00-24.00
Heavy breakable	28.00-29.00

Stainless Steel

18-8 sheets, clips, solids	140.00-145.00
18-8 borings, turnings	70.00-75.00
410 sheets, clips, solids	40.00-45.00
430 sheets, clips, solids	50.00-55.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	23.00-24.00
No. 2 heavy melting	19.00-20.00
No. 1 bundles	23.00-24.00
No. 1 busheling	23.00-24.00
Machine shop turnings	5.00-6.00
Shovel turnings	9.00-9.50
No. 1 cast	39.00-40.00
Mixed cupola cast	30.00-30.50
No. 1 machinery cast	40.00-42.00

BIRMINGHAM

No. 1 heavy melting	32.00-33.00
No. 2 heavy melting	22.00-23.00
No. 1 bundles	33.00-34.00
No. 2 bundles	20.00-21.00
No. 1 busheling	32.00-33.00
Cast iron borings	10.00-11.00
Machine shop turnings	15.00-16.00
Shovel turnings	18.00-19.00
Bar crops and plate	37.00-38.00
Structurals & plate	36.00-37.00
Electric furnace bundles	34.00-35.00
Electric furnace:	
3 ft and under	34.00-35.00
2 ft and under	35.00-36.00

Cast Iron Grades

No. 1 cupola	45.00-46.00
Stove plate	45.00-46.00
Unstripped motor blocks	33.00-34.00
No. 1 wheels	34.00-35.00

Railroad Scrap

No. 1 R.R. heavy melt.	32.00-33.00
Rails, 18 in. and under	45.00-46.00
Rails, random lengths	37.00-38.00
Angles, splice bars	37.00-38.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	27.00
No. 2 heavy melting	25.00
No. 1 bundles	28.00
No. 2 bundles	20.00
No. 1 busheling	28.00
Machine shop turnings	8.00
Shovel turnings	10.00

Cast Iron Grades

No. 1 cupola	38.00
Charging box cast	33.00
Heavy breakable cast	31.00
Unstripped motor blocks	33.00
Clean auto cast	41.00
Stove plate	35.00

Railroad Scrap

No. 1 R.R. heavy melt.	32.00
Rails, random lengths	37.00
Rails, rerolling	49.00
Rails, 18 in. and under	40.00
Angles, splice bars	37.00

HOUSTON

(Brokers' buying prices; f.o.b. car)

No. 1 heavy melting	*35.00-36.00†*
No. 2 heavy melting	*31.00*
No. 1 bundles	*35.00-36.00*
No. 2 bundles	*21.00-22.00*
Machine shop turnings	7.00-8.00†
Low phos. plate & structurals:	
3 ft	*36.00-37.00*
2 ft and under	39.00-40.00

Cast Iron Grades

No. 1 cupola	36.00-37.00
Heavy breakable	24.00
Foundry malleable	29.00-30.00†
Unstripped motor blocks	30.00-31.00

Railroad Scrap

R. R. heavy melt. (3 ft)	*36.00-37.00*

LOS ANGELES

No. 1 heavy melting	30.00
No. 1 hvy melt (export)	34.00*
No. 2 heavy melting	28.00
No. 2 hvy melt (export)	30.00*
No. 1 bundles	25.00
No. 2 bundles	19.00
No. 2 bundles (export)	22.00*
Machine shop turnings	12.00
Shovel turnings	12.00
Cast iron borings	12.00
Cut structurals and plate 1 ft and under	40.00

Cast Iron Grades

No. 1 cupola	39.00

Railroad Scrap

No. 1 R.R. heavy melt.	34.00-36.00

PORTLAND, OREG.

(Prepared, f.o.b. car)

No. 1 heavy melting	*38.00-39.00*
No. 2 heavy melting	*35.00-36.00*
No. 2 bundles	*22.00-23.00*
Shovel turnings	13.00
Electric furnace bundles	46.00

Cast Iron Grades

No. 1 cupola	*39.00*
Heavy breakable	*36.00-37.00*
Unstripped motor blocks	*33.00*
Stove plate (f.o.b. plant)	*35.00-36.00*

SEATTLE

(Prepared, f.o.b. car)

No. 1 heavy melting	*38.00-39.00*
No. 1 hvy (unprepared)	*33.00-35.00*
No. 2 heavy melting	*35.00-36.00*
No. 2 hvy (unprepared)	*31.00-33.00*
No. 2 bundles	*22.00-23.00*
Shovel turnings	15.00
Electric furnace bundles	46.00

Cast Iron Grades

No. 1 cupola	*39.00*
Heavy breakable cast	*36.00-37.00*
Unstripped motor blocks	*31.00-33.00*
Stove plate (f.o.b. plant)	*35.00-36.00*

SAN FRANCISCO

No. 1 heavy melting	32.00
No. 2 heavy melting	29.00
No. 1 bundles	27.00-28.00
No. 2 bundles	18.00
Machine shop turnings	14.00
Mixed borings, turnings	14.00
Cast iron borings	14.00
Heavy turnings	14.00
Shovel turnings	14.00
Cut structurals, 3 ft	40.00

Cast Iron Grades

No. 1 cupola	46.00-48.00
Charging box cast	34.00
Stove plate	34.00
Heavy breakable cast	28.00
Unstripped motor blocks	31.00
Clean auto cast	40.00
Drop broken machinery	45.00-46.00
No. 1 wheels	34.00

HAMILTON, ONT.

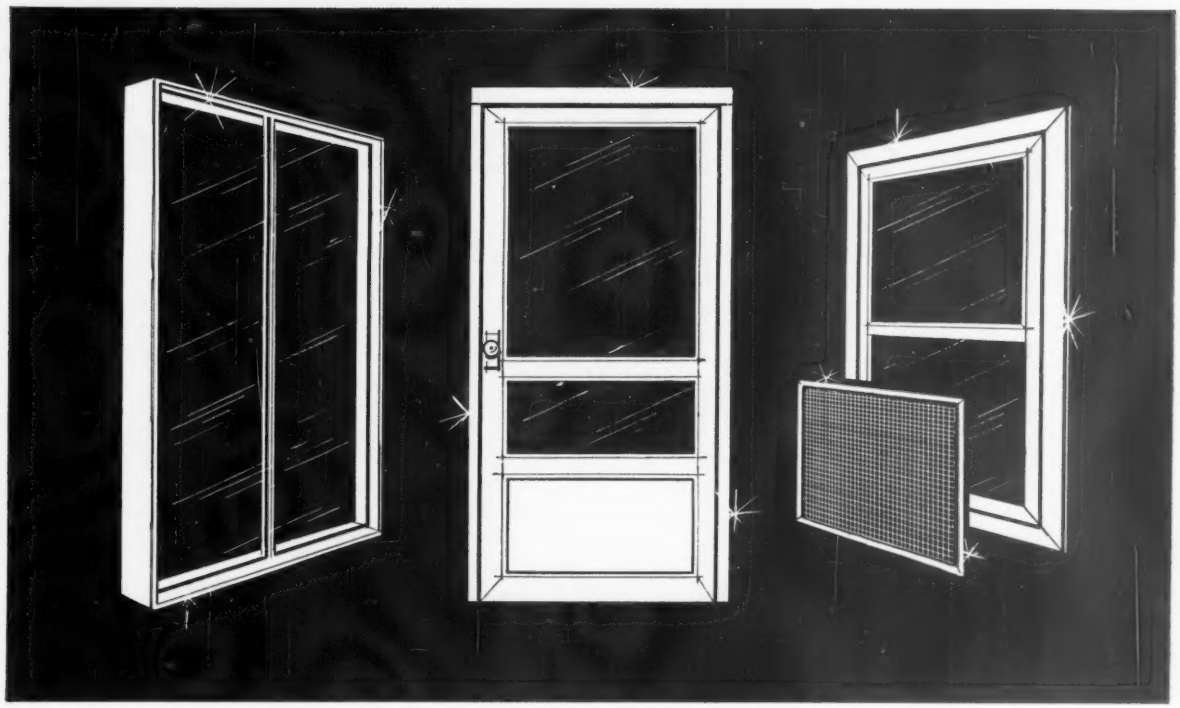
(Brokers' buying prices; net tons)

No. 1 heavy melting	24.00
No. 2 hvy melt, 2 ft & under	22.50
No. 1 bundles	24.00
No. 2 bundles	17.00
Mixed steel scrap	16.00
Mixed borings, turnings	12.00
Busheling, new factory:	
Prepared	23.00
Unprepared	18.00
Shovel turnings	12.00

Cast Iron Grades‡

No. 1 machinery cast	30.00

*For export add $4 dock charge.
†Nominal.
‡F.o.b. Hamilton, Ont.
§Delivered.



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BONDERITE 725 adds exceptional corrosion resistance to aluminum without changing the appearance of the metal!

This new Bonderite produces a *colorless,* amorphous oxide coating on aluminum without the use of electric current. In addition to imparting excellent corrosion resistance to aluminum, Bonderite 725 coatings are an excellent base for clear lacquer and paint finishes.

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Bonderite 725 is an efficient, economical chemical treatment applied by spray or immersion application in simple processing equipment. Processing times are as low as 5 seconds.

Up-grade the quality of your products by supplying corrosion resisting Bonderized aluminum in its pleasing natural color. You can add this sales advantage to your product at a treatment cost that will please you.

For complete information now, call or write Parker, or use coupon below.

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Rust Proof Company
2158 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

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Parker Rust Proof Company
2158 E. Milwaukee, Detroit 11, Michigan

Please send Bulletin which describes Colorless Bonderite for Aluminum.

Name_____

Title_____

Company_____

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City_____ Zone_____ State_____

Drought in Metal Sales Continues

Nonferrous Metal Prices, Page 114

IF RECOVERY is in sight, the nonferrous industry has yet to spot it. Sales are slow—but probably no worse than they were earlier in the year. Few buyers seem to be adding to inventories, though some claim they plan to over the next 60 to 90 days (see STEEL, Feb. 6, p. 120). Prices appear to be steady.

• **Zinc**—The zinc industry is symptomatic of the generally slack economy. January shipments totaled 61,811 tons (see graph), the poorest showing since last July. January production rose to 77,373 tons, the highest since last May. The result: Producer stocks shot up to 206,372 tons. It's significant that of the 16,000 ton rise in stocks, 12,000 tons were special high grade zinc. (That's the diecasting grade for autos and appliances.)

• **Lead**—Mounting stocks and weak sales are again the problem. At the first of the year, lead stocks in the U. S. totaled 198,822 tons, those of the Free World, 381,276 tons.

So far, the only companies to announce production curtailments have been Consolidated Mining & Smelting Co. of Canada Ltd., which is cutting back lead output by 20 per cent, and American Zinc, Lead & Smelting Co., which will trim back its U. S. zinc production by 10 per cent over the next few months. Unless sales pick up soon, others will have to follow.

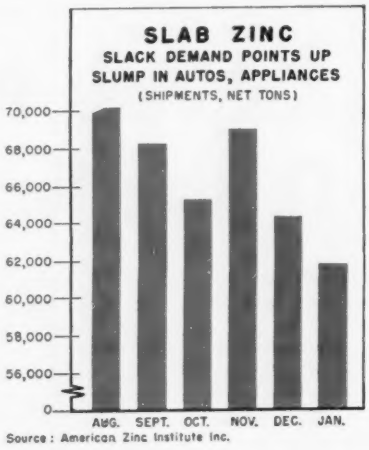
• **Copper** — February copper sales should wind up about on a par with January's (which were down a little from December's). Foreign demand continues to hold up fairly well, partially compensating for the weak U. S. market. The possibilities of further turmoil in Africa lend stability to present prices.

'60 Earnings Mixed

The profit picture for nonferrous metals companies in 1960 didn't follow a pattern. Some companies showed hefty gains; others had sharp declines.

In general, the first and second quarters were pretty fat periods. Profits tapered off in the third quarter and were really slapped around in the fourth.

The copper companies did well, reflecting the rebound from the strikes of 1959 and the maintenance of a pretty fair price over most of 1960. Kennecott Copper Corp. had a net of $77,395,187 vs. $57,340,111 in 1959. Phelps Dodge Corp. hiked profits to $36,047,716 vs. $33,459,115 in the preceding year. Magma Copper Co. reported a net of $8,079,659 compared with a 1959 loss of $2,506,362.



Source: American Zinc Institute Inc.

Copper fabricators didn't do nearly so well. Reports beginning to trickle in indicate weak prices and disappointing demand combined to slash profits of many companies.

American Smelting & Refining Co., heavy in copper but also a producer of many other metals, saw its profits nearly double to $23,700,000. American Metal Climax Inc., also a producer of many metals, had its best year in history, registering earnings of $38,700,000.

Aluminum companies had varying success. Aluminum Co. of America, with slightly greater sales, saw its profits dip $15.5 million to $40,044,105. Kaiser Aluminum & Chemical Corp., with slightly lower sales than it had in 1959, enjoyed a $300,000 gain to $22,771,000, the result, says President D. A. Rhoades, of "specific internal programs set up as long ago as 1957 to obtain maximum operating efficiencies." All the aluminum companies suffered from the price weakness in mill products.

In the Markets

• **Exports Saved the Day**—The export market was the ace in the hole for U. S. primary aluminum producers in 1960. When domestic sales began to slip, exports of crude metal spiraled, thanks mainly to rising demand in England and West Germany. Total for the year was 285,000 tons, more than double the 121,000 tons shipped in 1959, reports the Business & Defense Services Administration. Aluminum scrap also shared in the export boom—79,500 tons were shipped overseas vs. only 32,400 tons in 1959. Outlook for '61: Exports may fall due to more capacity in Europe, some slump in demand.

• **Mercury Drops**—As the mercury went up on the storm-lashed East Coast, the price of the metal in the New York market dropped $1 a flask (in large lots). Probable reason was the desire of one source to dispose of a newly arrived shipment. With sales maintaining a slow but fairly even pace, some observers believe the price might go back up in a week or two.

• **Magnesium Improved** — Primary magnesium production last year went up 29 per cent to 40,070 tons, the best year since 1957, reports the Magnesium Association. Primary shipments continued to exceed output—they topped 54,000 tons. Shipments of wrought products dropped 6 per cent to 10,359 tons, and castings were down about 13 per cent to around 12,000 tons. Outlook for '61: Not much change.

LIQUIDATION EAST LEHIGH NAVAL ORDNANCE PLANT

Applebutter Road, Bethlehem, Penna.

MACHINE TOOLS • FORGING EQUIPMENT • FURNACES • HEAT TREATING

MOST EQUIPMENT USED ONLY TWO YEARS OR LESS

BLOWERS
7—Allen Billmeyer 100 CFM, Turbo, 50 HP
5—Clarage No. 2½, MD., 30 HP
20—G.E. 450, 10,000-3000 CFM, A.C. Motors
9—Spencer Turbo, 2000 CFM

BOILERS
2—B&W 4000 HP., Type F 175 PSI, 475° F., 150,000 lbs./hr., oil and pulverized coal, all aux. equip.

BLAST CLEANING EQUIPMENT
1—American Pressure Blast Cabinets, Dust Collector
1—Pangborn Type ES—140 Air Blast Cabinet
1—Pangborn Type ES—141 Airless Rotoblast Cab.

BORING MILLS HORIZONTAL
Moline 4" Hydraulic Floor Type 3'x10'

BURNERS—FURNACE
50—Hauck #782
525—Duradiant #670
75—Hauck Atomizing #790
125—Hauck #668
500—Hauck #700
100—Hauck #780

CENTERING MACHINES
3—Frew Centering Machine Hydraulic
1—Stoker Simplex 3U

CHARGING MACHINES
3—Brosius 6,000 lbs., Auto. Floor on Rubber Wheels
1—Brosius 15,000 lbs., Auto. Floor on Rubber Wheels

CRANES—HOISTS
93—500 lb. Shepard Niles Electric Hoists, Plain Trolleys, D.C.
45—4000 lb. Shepard Niles Electric Hoists, Motor Driven Trolleys, D.C.
75—24' & 30' wall type jib cranes for above hoists
15—Pillar type jib cranes for above hoists, 12' to 18'
10—G.E. radial hoists for handling hot forgings

DRAW BENCHES
5—Bethlehem 100 ton, 11'6" stroke, hydraulic

DRILL PRESSES
Barnes Model #210, Box column, P.F.
Demco ⅝" Hi speed sensitive single spindle

DUST COLLECTOR
No. 20 Rotocione Type D—Exhauster Collector

FLOOR PLATES
12—10'x14'x26"—50,000 lbs. each
1—12'x40'x26"—190,000 lbs.

FURNACES—HEAT TREATING—LEAD POTS
10—Carbottom Recirculating Furnace 14'x50'
2—Flame Hardening 12'x15' with gas trans. system, Mixing Machine and After Coolers
1—Bung top heat treating furnace, 14'x108', including Pyrometer, Seal Plates and Blowers
10—14'9"x18' hearth type Reheat gas or oil
2—Mahr Double Chamber Oil Fired Forge Furnaces
3—Mahr #415 Steel cased and insulated oil fired
1—Gas Fired Die heating furnace
10—Bung top heat treating furnace, 11'x40'
10—G.E. Single Compartment intermittent conveyor type electric 8'x45' with pushers and shoes
10—G.E. Lead Pots 36"x72" with Radial Hoists, 18" grabs, 42" hydraulic lift electric trolley
4—General Electric RB-24 Box type electric furnace
6—Oil or gas fired draw furnaces
4—Oil or gas 10'x12' 10" annealing or forging
4—Oil or gas fired, bung 9'x12' for heat treating or forging
6—Bell bung top heating, blowers and controls, gas or oil
4—G.E. Rotary furnaces complete with charging, discharging and control equip., auto., 20' dia.
8—G.E. single compartment conveyor type draw furnaces 8' wide, 12'5" long x 15" double door
4—Dip tanks 9' long x 4' wide x 3½' high
12—G.E. Conveyor type single compart. heat treating furnaces, 8' x 13'5" x 15", double door
1—G.E. PRB #18 Box Type Electric
2—Electric solder heating pots
5—Salem oil or gas rotary forge or heat treating with charging and discharging tongs, conveyors
1—Type H Salt Bath furnace complete
1—Type P Salt Bath furnace complete
3—Vertical Air Draw furnaces

GRINDERS—PLAIN
4—Fitchburg 10"x48" model B hydraulic
2—Norton 10'x48"
1—Norton 24'x96"

GRINDERS—TOOL AND CUTTER
8—Bridgeport 4½ wet tool grinder, 30"
Blount 30" wet tool grinder
2—Ex-Cell-O #46 double end carbide
Ex-Cell-O #49 heavy duty double end carbide
2—Cincinnati #2 Universal, tool and cutter
1—S-U Hisey Wolf, 3 HP, double end pedestal
Boggis 700 tap grinder
2—Seller 4T universal tool bit
6" Hammond double end pedestal
4" Hammond double end carbide, M.D.

GRINDERS UNIVERSAL
2—Landis 14" x 72" type C hydraulic—internal
2—Norton 14" x 72" type C hydraulic—internal

GRINDERS—MISCELLANEOUS
Ex-Cell-O 35L Universal Thread
LG2 Stowe Flexible shaft grinder pedestal

HAMMERS
2000 lbs. Erie Double Frame Steam Forging
6000 lbs. Chambersburg Steam Double Frame Forging
8000 lbs. Chambersburg Steam Double Frame Forging

LATHES—AUTOMATIC
Fay 12"x21", front and back slide, 12" 3-jaw chuck
Sparks semi-automatic hydra-feed, 21"x52"
B&B semi-automatic hydraulic, 12"x36"

LATHES—BORING, CENTER DRIVE
1—Niles 47"x33'4"x33'4", dbl. end hollow spindle
9—Wicks 30"x25'x25', double end hollow spindle
2—Hepburn band turning lathe, 14'x24', M.D.

LATHES—ENGINE
American 24"x72", geared anti-friction tracing, H.D.
American 24"x101", geared anti-friction, M.D.
4—American Pacemaker 20x48, profile Att., Timken
2—LeBlond 20"x120", Timken, P.R.T., taper
2—Niles 30"x108" Time Saver, anti-friction P.R.T.—tracing
2—Niles 30"x120" Time Saver, anti-friction, P.R.T.—taper
Mackintosh-Hemphill 60"x60", anti-friction, P.R.T.
Mackintosh-Hemphill 94"x30", P.R.T., Anti-Friction
2—Monarch 27"x60" Model N, Timken sizing
Monarch 24"x60" Model N, Timken tracing
Monarch 27"x108" Model N, Timken
Sydney 30"x84" Herringbone anti-friction taper
7—Simmons 48"x20', Herringbone—profile Att., P.R.T.
Sommerfield 52"x76', Timken—2 carriage, P.R.T.
Sommerfield 60"x36' hd., Timken—2 carriage, P.R.T.

LATHES—BORING & TURNING
Sommerfield 50"x60', Timken screw cut.—P.R.T.
Sommerfield 50"x76', Timken screw cut.—P.R.T.
Sommerfield 50"x80', Timken screw cut.—P.R.T.
2 Betts Bridgeford 60"x80', 2 carriage, P.R.T.

LATHES—TURRET
4—3A—Warner & Swasey chucker—6¼ hole
8—4A Warner & Swasey, 9" hole chuckers
3R—Gisholts chucker, 5¼" hole
3—3R Gisholts chucker, 5¼" hole screw cutting
4—4R Gisholts chucker, 9½" hole
2—4R Gisholts chucker, 9½" hole screw cutting
1—4R Gisholts chucker, 9½" hole 6' long screw cut

LIFT TRUCKS
1—6000 lbs. Yale K4I center control ready power
5—10,000 lbs. Yale low lift ready power

MILLER TREADS
2—Hall Style D planetary
2—Hansen & Whitney—10x48
3—Loes Bradner—12x24 HT
3—Smalley General #27, M.D., Internal

MILLING—MISC.
2 Root, 3 Way Automatic with 3 verticals, M.D., paced 120 degrees apart auto. cycles

MILL
Salem Witter 5' Tube Processing

MOTOR GENERATORS
Westinghouse (1) 125 HP; (1) 100 HP; (1) 75 HP; All 220 variable voltage

PLANERS
4—Mesta 6'x35' Post
2—Mesta 14'x35' Pit

PLATE HARDENING
Plate hardening furnace, 12'x15' gas transmission system mixing machines, after cooler, Spray quench water 12'x30'

PRESSES—HYDRAULIC
400 Ton Bethlehem, 4 post down moving bed 95½x45", Stroke 42"
300 Ton Wilson Forging Press, six position turret type Ram head, 2 work holder auto. load and unload
2—400 Ton United down moving 3 rod forging, 100" dia turret indexing 4 pos. bed, stroke 48"
1,000 Ton Watson Stillman straightening—four rod type—bed 86x72—Ram 42"x72"—Stroke 48" with traveling bed and work rotators

6,500 Ton Mesta Down Moving 4 rod self-contained forming — bed 15'x15' — Ram 7'6"x16'—Stroke 60"—Daylight 84

PRESSES—STRAIGHT SIDE—GAP FRAMES
207½ Bliss single crank tie rod trim side shear—235 tons
1—509 Bliss geared tie rod single acting 415 tons—for billet breaking—auto. load and unload

PRESSURE VESSELS
4—A. O. Smith Hyro-pneumatic accumulators 2,400 gallons at 2865 PSI, 42" LD x 23'3" SS x 3-13/16

PULVERIZERS
2—B&W Ring Roll, 35 ton/Hr.
1—Jeffrey 24"x20" Rotary ring crusher, 70 HP.

PUMPS
LaBour size 25 type DPL, 200 GPM, 10 HP.
2—Byron Jackson vertical deepwell type 8K centrifugal, 6000 GPM, 300 HP
2—Pennsylvania, 500 GPM, 30 HP, centrifugal
2—Dravo single stage, double suction centrifugal
3—Byron Jackson 1½" BNL Bilton pumps
2—6ALV 1500 GM Ingersoll Rand
5—Bethlehem 450 GM Triplex, 2,500 PSI, 800 Syn. HP.
5—Worthington, 300 Syn. HP., 2,500 PSI, Triplex

QUENCHING EQUIPMENT
Circulating quench tanks with conveyor
Circulating tanks with manual handling equip.
Handling equipment for oil, water, brine
General Electric spin quench oil, water, brine
Rotating quench boshes

SAWS
8—Marvel 9H High Speed heavy duty
3—Newton 32" heavy duty hydraulic
2—Racine 33-CX 12"x16" hydraulic shear cut

SHAPERS
2—24" Rockford Hydraulic Universal
1—24" Steptoe Heavy Duty Universal

STACKS AND FLUES
5—Ind. Heat Flues; Stack 4' I.D. x 107' ceramic

TABLES
2—Die Turn Tables 21"x26"
Billet transfer table with roller table
3'8" roller table

TANKS
1,000 gallon gasoline with Bennet pump
13—Water, Oil Sludge, Dip Tanks

TESTERS
Bethlehem Pull Tester
Gogan—Model 1618 and Model 330 Brinell
Tinius Olsen No. 2 Standard
4—Shore Model C Scleroscope
2—Shore Model C-2 Scleroscope

TIRE SETTERS
4—West Hydraulic Tire Setters capacity up 20"

TRANSFORMERS
1000 KVA AC 11000/440/220

UNIT HEATERS
10—Crane Model 315 FBS, 1,500,000 BTU/HR
5—Webster Model 3995-4, Giant units

MISCELLANEOUS
2—16' Brassert Automatic self-cleaning water strainer; Jeffrey Coal Elevator; G.E. 70 HP. D.S.-114, 3,600 RPM Steam Turbines; 6—18" Westinghouse Search Lights; Tyman daters; 2—75 ton Morgan turning rigging, lifting rig and hooks and chain; 2—150 ton motorized transfer cars and track; 1—Model 804-2150 air reduction travograph with magnetic tracing device and table complete with 8 radiograph burners; 29—Pyrometers; Testing Cradle; Concentricity Gauges; Fairbanks Model No. 1170—1,500 lbs. scale; Up-Ending machines; Roll over stands; Shell lifter; 40—30" Buffalo type man coolers; 5—Ross 900 sq. ft. vertical oil coolers; Soldering rack and pot; DeVilbiss spray painting unit; Electric solder units; Borescope 20' x 1¾" with retriever; 12" x ⅞" with retriever; Slug Piler; Spray Pipe and mast; Machine Vises 4-6-8"; Copper oxide battery charger; 3-6" Shaffer Gross No 930 Syphone temp. regulators; 3—500 lb. Double Rated Airco Acetylene Generators; Lifting Tongs 6" to 16" Auto. and Chain; Chip Boxes; Circuit Breakers; Tote Boxes; Gas Converters; Detroit Degreaser Model 325; 5—Hydraulic Descalers up to 16" Billet; Turret Lathe Tooling; Atlas #25 Arbor Press; Storage Cabinets and Bins; 1500' Matthews 10' Section Roller Conveyor; Monorail 6"x10" Beam; 3—1400' Overhead Conveyors; Fire Brick.

MACHINES AT OTHER LOCATIONS:

1—LAKE ERIE 75 Ton, 100" Stroke, Draw Bench
1—80" ESPEN LUCAS Cold Saw
3—KEARNEY & TRECKER 5H Plain Milling Machine, Vertical Heads
2—KEARNEY & TRECKER 4K Vertical Mill
2—BARNES Center Col. Inverted, 5 Spindle 6 Station Drill
1—165 TOLEDO Double Action Toggle Press, 125 Tons
1—1200 KVA Flash Butt Welder, 850,000 lbs. Upset, 303000 Amps
1—4A WARNER & SWASEY extra long bed, 8" hole, 4 jaw chuck, threading and taper attachment, tooling
1—560T GIDDINGS & LEWIS 6" Bar Table Type Horizontal Boring Mill, High-Speed Spindle, New 1946
1—16 x 168 CINCINNATI Model QM Plain Grinder, 1946
3—BULLARD Cutmaster 54", 36" Side Head Chucks, All 1946
1—BULLARD 30" Man-Au-Trol with Side Head, New 1950
1—36" ROCKFORD Hydraulic Openside Shaper Rail & Side Head, New 1948

Contact: Mr. Rankin Johnson, Jr., P. O. Box 1216y, Bethlehem, Penna. Phone: UNiversity 5-0766

LURIA INDUSTRIAL DIVISION, Sales Agents

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99.5%, 50 lb ingots, 26.00, 30,000 lb or more, f.o.b. customer custody.

Aluminum Alloy: No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 31.50; No. 356, 26.80, 50 lb ingots.

Antimony: R.M.M. brand, 99.5%, 29.00; Lone Star brand, 29.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97% lump or beads, $70.00 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $65 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.75% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.60 per lb deld.

Cobalt: 99+%, $1.50 per lb for 500-lb keg; $1.52 per lb for 100 lb case; $1.57 per lb under 100 lb.

Columbium: Powder, $55 per lb and up nom.

Copper: Electrolytic, 29.00 deld.; custom smelters, 29.00; lake, 29.00 deld.; fire refined, 28.75 deld.

Germanium: First reduction, ingots, less than 1 kg, 36.00-37.50 per gram; 1-10 kg, 30.50-32.00 per gram; 10 kg or more, 28.10-29.99 per gram; intrinsic grade, under 10 kg, 31.95 per gram; 10 kg or more, 29.95 per gram.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $70-75 per troy oz nom.

Lead: Common, 10.80; chemical, 10.90; corroding, 10.90; St. Louis. New York basis, add 0.20.

Lithium: 1 lb or 2 lb ingots, less than 24 lb, $11 per lb deld.; 24-90 lb, $9.50; 100-499 lb, $9.25; 450 lb or more, $9 per lb, delivered.

Magnesium: Pig, 35.25; ingot, 36.00 f.o.b. Velasco, Tex., 1.3 in. diam. x 12 in. sticks, 57.00 f.o.b. Madison, Ill.

Magnesium Alloy: AZ91A (diecasting), 40.75; AZ63A, AZ92A, AZ81C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, N. York, $208-210 per 75 lb flask.

Molybdenum: Unalloyed forging billets, 4.125-8.5 in. diam., 50-4999 lb, $8.15 per lb, depending on quantity; 5000 lb or more, $8 per lb, f.o.b. Coldwater, Mich.

Nickel: Electrolytic cathodes, briquettes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot for addition to cast iron, in kegs, 74.50; "F" nickel, 5 lb ingots, 75.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01; Exton, Pa., basis, add 1.60. Nickel oxide sinter at Buffalo, New York, or other established U. S. Ports of entry, contained nickel 69.60.

Osmium: $70-90 per troy oz nom.

Palladium: $24-26 per troy oz.

Platinum: $82-85 per troy oz from refineries.

Radium: $16-21.50 per mg radium content, depending on quantity.

Rhodium: $137-140 per troy oz.

Ruthenium: $55-60 per troy oz.

Selenium: $6.50-7 per lb, commercial grade.

Silver: Open market, 91.375 per troy oz.

Sodium: Solid pack, c.l., 19.50; l.c.l. 20.00; 5 and 12 lb bricks, c.l., 21.00; l.c.l., 21.50; tank car, 17.00.

Tantalum: Melting stock, $35 per lb; rod $60 per lb nom; sheet, $55 per lb nom.

Tellurium: $3.50-5 per lb, 100 lb or more.

Thallium: $7.50 per lb.

Tin: Straits, N. Y., spot, 100.875; prompt, 100.75.

Titanium: Sponge, 99.3+% grade A-1, ductile (0.3% Fe max.), $1.60 per lb; grade A-2 (0.5% Fe max), $1.50 per lb.

Tungsten: Powder, 98.8%, carbon reduced, 100-lb lots, $2.75-2.85 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00c; 99+% hydrogen reduced, $3.10-4.00.

Zinc: Prime western, 11.50; brass special, 11.75; intermediate, 12.00, East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 12.85; special high grade, 13.00 deld. Die casting alloy ingot No. 3, 14.25; No. 2, 14.75; No. 5, 14.50 deld.

Zirconium: Reactor grade sponge, 100 lb or less, $8-8.50 per lb; 100-500 lb, $7.25-7.50 per lb; 500-1000 lb, $6.50-7.25; over 1000 lb, $6.50 per lb.

(Note: Chromium, manganese, and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 25.00-26.00; No. 12 foundry alloy (No. 2 grade), 22.75; 5% silicon alloy, 0.60 Cu max., 24.00; 13 alloy, 0.60 Cu max., 24.00; 195 alloy, 25.75; 108 alloy, 23.25. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 23.75; grade 2, 22.50; grade 3, 21.50; grade 4, 21.00.

Brass Ingot: Red brass, No. 115, 27.25; tin bronze, No. 225, 37.00; No. 245, 31.50; high-leaded tin bronze, No. 305, 31.75; No. 1 yellow, No. 405, 22.75; manganese bronze, No. 421, 26.50.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.25; AZ91C, 41.25; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.935, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.935, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 20,000-lb lots, 34.355; l.c.l., 34.98. Weatherproof, 20,000-lb lots, 35.55; l.c.l., 36.30.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $16.50 per cwt; pipe, full coils, $16.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheet and strip, $6.75-15.50; sheared mill plate, $5.25-9.00; wire, $5.55-9.50; forging billets, $3.20-4.75; hot-rolled and forged bars, $3.80-6.25.

ZINC

(Prices per lb. c.l., f.o.b. mill.) Sheets, 28.00; ribbon zinc in coils, 22.50; plates, 21.50.

ZIRCONIUM

Plate, $14.00-25.00; H.R. strip, $14.00-22.90; C.R. strip, $16.00-35.00; forged or H.R. bars, $11.00-17.40.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	138	120	138
Strip, C.R.	124	108	138
Plate, H.R.	130	110	126
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	200

ALUMINUM

(Selected products and sizes)

Flat Sheets: 1100, 3003, and 5005, mill finish, 30,000 lb base f.o.b. customer custody.

Thickness Range (in.)	Width (in.)	Length Range (in.)	Price Range
0.250-0.136	24-72	72-180	45.40-48.00
0.136-0.096	24-72	72-180	45.90-48.80
0.096-0.077	24-72	72-180	46.40-50.30
0.077-0.068	24-72	72-180	46.90-52.10
0.068-0.061	24-72	72.180	46.90-55.00
0.061-0.048	24-72	72-180	47.40-57.70
0.048-0.038	24-72	72-180	47.90-60.50
0.038-0.030	24-72	72-180	48.40-65.30
0.030-0.024	24-72	72-180	48.90-67.20
0.024-0.019	24-60	72-180	49.40-59.90
0.019-0.017	24-48	72-144	50.30-57.00
0.017-0.015	24-48	72-144	51.20-58.00
0.015-0.014	24-36	72-144	52.30
0.014-0.012	24-36	72-144	53.50
0.012-0.011	24-36	72-144	54.60
0.011-0.0095	24-46	72-144	56.20
0.0095-0.0085	24-36	72-96	57.50
0.0085-0.0075	24-36	72-96	59.20
0.0075-0.007	24-36	72-96	60.80
0.007-0.006	24-36	72-96	62.50

ALUMINUM (continued)

Plates and Circles: Thickness, 0.25-3 in.; width or diam., 24-60 in.; length, 72-240 in., mill finish.

Alloy	Plates Base	Circle Base
1100, 3003-F	44.60	50.90
5050-F	45.70	50.50
3004-F	46.70	52.40
5052-F	47.30	53.10
6061-T6	47.80	53.90
2024-T4*	51.80	58.90
7075-T6*	60.50	67.90

*24-48 in. width or diam., 72-180 in. lengths.

Screw Machine Stock: 30,000 base, 12 ft lengths.

Diam	Round		Hexagonal	
(in.)*	2011-T3	2017-T4	2011-T3	2017-T4
0.125	74.90	77.30	....	....
0.188	63.20	63.20	....	80.10
0.250	60.00	62.60	72.70	74.10
0.375	59.20	63.80	71.00	72.00
	2011-T3	2017-T451	2011-T3	2017-T451
0.500	59.20	63.80	71.00	72.00
0.625	59.20	63.80	67.80	67.90
0.750	57.70	62.00	61.60	63.80
0.875	57.70	62.00	61.60	63.80
1.000	57.70	62.00	61.60	63.80
1.125	55.30	59.50	59.50	61.50
1.250	55.30	59.50	59.50	61.50
1.375	55.30	59.50	59.50	61.50
1.500	55.30	59.50	59.50	61.50
1.625	53.00	56.70	....	59.30
1.750	53.00	56.70	58.30	59.30
1.875	53.00	56.70	....	59.30
2.000	53.00	56.70	58.30	59.30
2.250	51.50	55.00	....	59.30
2.500	51.50	55.00	....	59.30
2.750	49.90	53.20	....	59.30
3.000	49.00	53.20	....	59.30
3.250	....	53.20	....	....
3.375	....	53.20	....	....

*Selected sizes.

Forging Stock: Round, Class 1, random length, diam., 0.375-8 in., "F" temper; 2014, 47.50-57.60; 6061, 43.50-57.60; 7075, 61.80-71.90; 7079, 66.80-76.90.

Pipe: ASA schedule 40, alloy 6063-T6, 3-40 ft lengths, plain ends, 90,000 lb base, dollars per ft. Nominal pipe sizes: 1 in., 32.00; 1¼ in., 43.40; 1½ in., 51.80; 2 in., 62.60; 3 in., 124.95; 4 in., 171.80; 5 in., 233.15; 6 in., 308.55; 8 in., 464.35; 10 in., 716.25 (3-24 ft lengths).

Factor	Alloy 6063-T5	Alloy 6062-T6
1-14	45.30-46.80	54.00-60.00
15-17	45.30-46.80	56.50-61.80
18-23	45.80-47.50	58.60-67.60
24-32	45.80-47.50	66.80-81.50
33-38	49.50-52.20	85.10-96.60
39-44	59.80-63.60	102.00-124.00

MAGNESIUM

Sheets and Plates: AZ31B standard grades, .032 in., 103.10; .061 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.00 in., 67.90. AZ31B spec. grades, .032 in., 171.30; .061 in., 108.80; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Tread plate, 60-192 in. lengths, 24.72 in. widths; .125 in., 74.90; .188 in., 71.70-72.70; .25-.75 in., 70.60-71.60. Tooling plate, 0.25-3.00 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grades (AZ31B)
6-8	65.30-67.60	84.60-87.40
12-14	65.30-67.60	85.70-88.00
24-26	66.10-68.40	90.60-91.30
36-38	71.50-75.30	104.20-105.30

NONFERROUS SCRAP

DEALERS' BUYING PRICES

Copper and Brass: No 1 heavy copper and wire, 22.00-22.50; No. 2 heavy copper and wire, 20.00-20.50; light copper, 17.25-17.75; No. 1 composition red brass, 18.00-18.50; No. 1

BRASS MILL PRICES

MILL PRODUCTS a

	Sheet, Strip, Plate	Rod	Wire	Seamless Tubes
Copper	54.13b	51.36c	....	55.32
Yellow Brass	48.10	33.71d	48.39	52.26
Low Brass, 80%	50.65	50.39	50.94	54.71
Red Brass, 85%	51.54	51.48	51.83	55.60
Com. Bronze, 90%	52.98	52.92	53.27	56.79
Manganese Bronze	56.56–56.59	50.22–50.24	60.47	....
Muntz Metal	50.94	46.25	....	....
Naval Brass	52.86	46.67	59.17	57.02
Silicon Bronze	59.49	58.68	58.78	77.90
Nickel Silver, 10%	63.66	65.99	65.74	....
Phos. Bronze, A-5%	74.59	75.09	74.34	76.52

SCRAP ALLOWANCES e

(Based on copper at 29.00c)

	Clean Heavy	Rod Ends	Clean Turnings
Copper	25.000	25.000	24.250
Yellow Brass	19.250	18.375	17.375
Low Brass, 80%	21.375	21.125	20.625
Red Brass, 85%	22.250	22.000	21.500
Com. Bronze, 90%	23.000	22.750	22.250
Manganese Bronze	18.000	17.750	17.250
Muntz Metal	18.125	17.875	17.375
Naval Brass	18.000	17.750	17.250
Silicon Bronze	24.500	24.250	23.500
Nickel Silver, 10%	24.125	23.875	12.062
Phos. Bronze, A-5%	26.125	25.875	24.875

a. Cents per lb, f.o.b. mill; freight allowed on 50 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time of any or all kinds of scrap, add 1 cent per lb.

composition turnings, 17.00-17.50; new brass clippings, 15.50-16.00; light brass, 12.50-13.00; heavy yellow brass, 13.50-14.00; new brass rod ends, 14.50-15.00; auto radiators, unsweated, 13.50-14.00; cocks and faucets, 15.50-16.00; brass pipe, 15.50-16.00.

Lead: Soft scrap lead, 7.00-7.50; battery plates, 2.75-3.00; linotype and stereotype, 8.00-8.50; electrotype, 7.50-8.00; mixed babbitt, 8.00-8.50.

Monel: Clippings, 27.00-28.00; old sheets, 24.00-25.00; turnings, 18.00-19.00; rods, 25.00-26.00.

Nickel: Sheets and clips, 53.00-55.00; rolled anodes, 53.00-55.00; turnings, 39.00-40.00; rod ends, 53.00-55.00.

Zinc: Old zinc, 2.50-2.75; new diecast scrap, 2.75-3.00; old diecast scrap, 1.00-1.50.

Aluminum: Old castings and sheets, 9.00-9.50; clean borings and turnings, 4.50-5.00; segregated low copper clips, 11.00-11.50; segregated high copper clips, 10.00-10.50; mixed low copper clips, 10.50-11.00; mixed high copper clips, 10.00-10.50.

(Cents per pound, Chicago)

Aluminum: Old castings and sheets, 10.00-10.50; clean borings and turnings, 7.00-7.50; segregated low copper clips, 15.00-15.50; segregated high copper clips, 13.50-14.00; mixed low copper clips, 12.50-13.00; mixed high copper clips, 12.00-12.50.

(Cents per pound, Cleveland)

Aluminum: Old castings and sheets, 10.00; clean borings and turnings, 8.50; segregated low copper clips, 14.00; segregated high copper clips, 13.00; mixed low copper clips, 13.00; mixed high copper clips, 12.50.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 55.00; light scrap, 50.00; turnings and borings, 35.00.

Copper and Brass: No. 1 heavy copper and wire, 24.50; No. 2 heavy copper and wire, 23.00; light copper, 20.75; refinery brass (60% copper) dry copper content, 21.00.

INGOTMAKERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, 24.50; No. 2 heavy copper and wire, 23.00; light copper, 20.25; No. 1 composition borings, 19.50-20.75; No. 1 composition solids, 20.50-21.25; heavy yellow brass solids, 15.50-16.50; yellow brass turnings, 13.00-15.50; radiators, 16.50.

Plating Material

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.60.

Copper: Flat-rolled, 46.04; oval, 42.50; electrodeposited, 38.00; cast, 40.50; 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, 114.25; 100-499 lb, 112.00; 500-4999 lb, 107.50; 5000-29,999 lb, 105.25; 30,000 lb, 103.00. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 119.50; 200-499 lb, 118.00; 500-999 lb, 117.50; 1000 lb or more, 117.00.

Zinc: Balls, 18.75; flat tops, 18.75; flats 21.50; ovals, 20.75, ton lots.

CHEMICALS

Cadmium Oxide: $1.60 per lb in 100-lb drums.

Chromic Acid (flake): 100-2000 lb, 31.00; 2000-10,000 lb, 30.50; 10,000-20,000 lb, 30.00; 20,000 lb or more, 29.50.

Copper Cyanide: 100-200 lb, 65.90; 300-900 lb, 63.00; 1000-19,000 lb, 61.90.

Copper Sulphate: 100-1900 lb, 15.00; 2000-5900 lb, 13.00; 6000-11,900 lb, 12.75; 12,000-22,900 lb, 12.50; 23,000 lb or more, 12.00.

Nickel-Chloride: 100 lb, 45.00; 200 lb, 43.00; 300 lb, 42.00; 400-4900 lb, 40.00; 5000-9900 lb, 38.00; 10,000 lb or more, 37.00.

Nickel Sulphate: 5000-22,999 lb, 29.00; 23,000-39,900 lb, 28.50; 40,000 lb or more, 28.00.

Sodium Cyanide (Cyanobrik): 2000 lb, 23.80; 400-900 lb, 20.80; 1000-4900 lb, 19.80; 5000-19,900 lb, 18.80; 20,000 lb or more, 17.60.

Sodium Stannate: Less than 100 lb, 79.10; 100-600 lb, 69.70; 700-1900 lb, 67.00; 2000-9900 lb, 65.10; 10,000 lb or more, 63.80.

Stannous Chloride (Anhydrous): 25 lb, 154.40; 100 lb, 149.50; 400 lb, 147.10; 800-19,900 lb, 106.20; 20,000 lb or more, 100.10.

Stannous Sulphate: Less than 50 lb, 139.60; 50 lb, 109.60; 100-1900 lb, 107.60; 2000 lb or more, 105.60.

Zinc Cyanide: 100-200 lb, 59.00; 300-900 lb, 57.00.

(*Concluded from Page* 109)

Algoma Steel had sales and investment income of $143,247,000 compared with $164,533,000 the year before. Its profits were $13,253,000 vs. $17,606,000 in 1959.

Steel Shipments in 1960 Score 2.6 Per Cent Gain

Mill shipments of finished steel products in 1960 totaled 71,149,218 net tons, reports the American Iron & Steel Institute. The total was 2.6 per cent above the 69,377,067 tons shipped in 1959 and only 16 per cent below the record 84.7 million tons moved in 1955.

Shipments in December, 1960, were 4,116,047 net tons vs. 4,516,020 tons in the preceding month and 8,211,047 tons in December, 1959.

Shipments of electrolytic tin plate set an annual record last year at 5,075,502 net tons. The total topped the previous high of 5,040,190 tons set in 1958. Galvanized sheet shipments also were record breaking, totaling 3,056,996 tons against the former high of 2,957,991 in 1956.

Principal product shipments in December and all of 1960:

Leading Steel Product Shipments—1960
(Net tons)

Products	December	12 months
Cold rolled sheets	865,677	14,466,261
Hot rolled sheets	449,651	7,990,748
Hot rolled bars	392,428	6,915,435
Plates	378,045	6,131,587
Electrolytic tin plate ..	239,978	5,075,502

Direct mill shipments for automotive purposes totaled 14,616,666 net tons of finished steel products last year, the third highest annual total. The record: 18,721,880 tons in 1955.

Market classifications receiving the largest amounts of steel last year were:

Largest Steel Market Outlets—1960
(Net tons)

Markets	December	12 months
Automotive	900,771	14,616,666
Warehouses	682,131	12,493,477
Construction	588,646	9,680,619
Containers	317,122	6,428,123
Machinery, etc.	214,091	3,956,799

Tin Plate . . .

Tin Plate Prices, Page 100

A seasonal pickup in demand for tin plate is expected over the next several months.

It's reported that a Chicago food processing company is experimenting with cans made of double reduced tin plate for other than frozen citrus juices. The bodies of the cans are made of the new thin plate, while the ends are made of regular gage plate.

The company is also testing aluminum, mainly for can ends, it is reported.

Rails, Cars . . .

Track Material Prices, Page 103

An order for 1000 coal hopper cars of 85 ton capacity has been placed with its Roanoke, Va., shops by the Norfolk & Western Railway.

CLASSIFIED

MOTORS • GENERATORS • TRANSFORMERS
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World's Largest Inventory
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Wheelabrator Cabinet, Roller Conveyor System 66" x 33" x 71" complete with all motors and controls. Ideal for cleaning tubing, pipe, channels, angles, tanks, plates, sand blasting tanks, cabinets, vacuum blast hydroblast, Detroit Tinius Olsen hardness testers.
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Machinery and Equipment Wanted

WANTED
Used SIZE 2 OR 3 FOURSLIDE FORMING MACHINES. BAIRD, MANVILLE, U. S. MULTISLIDE.
R. F. NAUMAN MFG. CORP.
222 Chicago Street Buffalo 4, N. Y.

Help Wanted

WANTED—AUDITOR, Cost Accountant for small basic steel plant, normal employment 250, write personnel data, experience qualifications. Confidential. Box 906, STEEL.

LARGE FABRICATOR OF STRUCTURAL STEEL for buildings, bridges, dams, locks, etc., located in deep south, seriously looking for qualified Chief Draftsman. Must assume complete responsibility for operation of drafting room of over fifteen men. Prefer Civil Engineer with at least 10 years' experience in structural detailing, capable of commanding the co-operation of his men and obtaining the highest quality of workmanship. We are seeking a highly trained man with executive capacity, and expect to pay the right salary for the right man. In reply give full experience record and educational background, stating age, marital status and salary expected. Reply Box 903, STEEL, Penton Bldg., Cleveland 13, Ohio.

SALESMAN TO COVER CHICAGO TERRITORY selling mill and heavy industrial overhead traveling cranes. Respond to Box 893, STEEL, Penton Bldg., Cleveland 13, Ohio.

WANTED—PURCHASING AGENT for small basic steel plant, normal employment 250, write personnel data, experience and qualifications. Confidential. Box 905, STEEL.

NEW! CHAMBERSBURG POWER/TROL

a power assist control system for operating single frame and double frame forging hammers

NOW, on Chambersburg Single Frame or Double Frame Flat Die Forging Hammers, of 2500 lbs. (falling weight) or larger, the new POWER/TROL transfers operation of the hammer from the large, heavy, awkward lever controls located on the hammer frame, to two power-assisted, hand-operated controls mounted on a console which can be placed anywhere within 20 feet of the hammer, free from overhead hazards, intense heat, flying scale, etc. The hammerman's job is easier and safer than ever before, and forging is faster.

POWER/TROL to upgrade existing Chambersburg flat die hammers costs less than $3500.00!

ADVANTAGES:

- **the hammerman is at a safe location, convenient to his crew**
- **hammer operation is practically effortless**
- **blow sensitivity is retained**
- **more forging can be accomplished each heat**

Write today for a copy of Bulletin 99-L-O

CHAMBERSBURG ENGINEERING COMPANY • CHAMBERSBURG, PA.

CHAMBERSBURG

• The Hammer Builders •

DESIGNERS AND MANUFACTURERS OF THE IMPACTER

When it's a vital part, design it to be FORGED

The order is expected to keep the Roanoke Shops' car assembly line in production during most of 1961. The shops will turn out four to eight cars daily, depending on the demand for putting the new equipment into service.

Work on the $12 million order begins in April after completion of a current order for 1000 cars of the same design—that project was started last August.

The hoppers, an original N&W design, are said to be the only 85 ton coal carriers on any U. S. railroad. The latest order specifies roller bearing wheels 36 in. in diameter, 3 in. larger than standard freight car wheels.

Some 32,500 tons of steel (sheets, castings, rods, and bar stock) will be required for the new order. Each car uses about 65,000 lb.

Plates . . .

Plate Prices, Page 98

Although plates continue to move slowly, demand is a shade better in spots.

The Norfolk & Western Railroad is covering on steel required for 1000 coal hopper cars to be built at its Roanoke, Va., shops. It also needs steel for several other small car lists. The shipbuilding outlook is improved with the Sun Shipbuilding & Dry Dock Co., Chester, Pa., low bidder on three cargo ships for the American-Hawaiian Steamship Co.

Demand for steel for pressure vessels and tanks is quickening. Among pending projects are 1200 tons for a water tank at Portland, Oreg., and tonnage required for a 24 in. water supply line at Port Angeles, Wash. Plate fabricators lost out on a tonnage for Alderwood Manor, Wash., which went prestressed concrete for a 28-million-gallon reservoir.

Most platemakers anticipate a general pickup in demand by late March or early April. Sheared and universal plate deliveries still range ten days to two weeks.

Steel Bars . . .

Bar Prices, Page 98

The commercial steel bar market is drifting, though a fair diversity of small lot buying is reported. Producers feel the lag in automotive requirements more severely than the

slack in other areas of the market.

Cold finished bar inquiry is featured by a slight pickup in government orders for armament steel. But shipments are generally easy.

Although some auto orders originally scheduled for February shipment have been deferred until March, barmakers say pushbacks aren't a big factor in the current market situation. The big problem is getting orders.

Structural Shapes . . .

Structural Shape Prices, Page 98

While structural steel demand continues to lag and price competition appears to be as sharp as ever, there is an increasing amount of new work reported on architects' boards. Most of it is public in nature—bridges, highways, schools, and administrative buildings.

Fabricators are keenly interested in a Montana missile project involving 12,000 tons of structurals on which rebids were recently taken by the U. S. Engineer. A job at the Hanford Works involves 700 tons, and substantial tonnage is pending for radar projects.

Mill shipments of structurals are available in three to four weeks, in some instances sooner.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PENDING

1700 tons, state highway work, FASH 61-1, New York, Hendrickson Bros., Valley Stream, Long Island, N. Y., general contractor.

1420 tons, two state bridge projects, Prince William County, Maryland; bids Mar. 3.

1300 tons, state bridgework, Nassau County, New York; bids Feb. 23.

860 tons, state highway work, Monroe County, New York; bids Feb. 13.

650 tons, state bridgework, B 635-82-42, Newark, Del.; bids closed.

360 tons, state bridgework, Westchester County, New York.

245 tons, state bridgework, U.S. 22-Sec. 14-B, Union County, New Jersey; project postponed indefinitely; bids were to have been opened Feb. 16.

154 tons, state bridgework, LR 246 (17), Allegheny County, Pennsylvania; bids Mar. 3; also required are 1191 tons of reinforcing bars.

142 tons, state bridgework, Suffolk County, New York; bids Feb. 23.

100 tons or more, 50 ton electric crane and 150 ton shear leg derrick; bids to Port of Seattle, Mar. 10.

100 tons, steel frame radar tower, North Bend, Oreg.; bids to the U. S. Engineer, Seattle, Mar. 14.

REINFORCING BARS . . .

REINFORCING BARS PLACED

2130 tons, 50 tons of shapes and piling also involved, four Washington State highway structures, King County, to Northwest Steel Rolling Mills Inc., Seattle; general contract to Bergeson & Roberts and Early Construction Co., Tacoma, Wash., joint low bidders at $1,506,154.

Advertising Index

Aetna-Standard Division, Blaw-Knox Co. ..... Inside Front Cover
Air Reduction Sales Co., A Division of Air Reduction Co., Inc. 6
Allis-Chalmers, Industrial Equipment Division 80
American Chain & Cable Co., Inc., Wright Hoist Division 9
Arcos Corporation 86, 87
Armco Steel Corporation, Armco Division .. 2, 3

Barber-Colman Co., Wheelco Industrial Instruments Division 14, 15
Bethlehem Steel Co. 1, 21, 22, 23, 24
Birdsboro Corporation 107
Blaw-Knox Co., Aetna-Standard Division ..... Inside Front Cover

Chambersburg Engineering Co. 116
Chicago Steel Service Co. 39
Consolidated Machine Tool Division, Farrel-Birmingham Co., Inc. 102
Copperweld Steel Co., Ohio Seamless Tube Division 30
Copperweld Steel Co., Superior Steel Division 45

Drever Co. 69
Dynamatic Division, Eaton Manufacturing Co. 50
Dyson, Joseph, & Sons, Inc. 10

Eaton Manufacturing Co., Dynamatic Division 50
Electric Controller & Mfg. Division, Square D Co. 78, 79
Electric Equipment Co. 115
Electric Furnace Co., The 49
Erie Foundry Co. 25
Esso Standard, Division of Humble Oil & Refining Co. 60
Euclid Crane & Hoist Co., The 46

Farrel-Birmingham Co., Inc., Consolidated Machine Tool Division 102
Foote Mineral Co. 40

Garlock, Inc. 118

Hanna Furnace Corporation, The, A Division of National Steel Corporation 92
Hitchiner Manufacturing Co., Inc. 53
Humble Oil & Refining Co., Esso Standard Division 60

International Nickel Co., Inc., The 26

Jessop Steel Co. 101

Lindberg Engineering Co., Heat Treating Furnace Division 89
Luria Industrial Division 113

McKay Machine Co., The 28, 29
McLouth Steel Corporation 83

Marchant, Geo. F., Co. 82
Mesta Machine Co. 71

National Steel Corporation, The Hanna Furnace Corporation Division 92
Nauman, R. F., Mfg. Corporation 115

Ohio Electric Mfg. Co., The 85
Ohio Seamless Tube Division of Copperweld Steel Co. 30
Oilgear Co., The 7

Parker Rust Proof Co. 111
Pittsburgh Engineering & Machine Division, Pittsburgh Steel Foundry Co. 73

Republic Steel Corporation 12, 13
Ryerson, Joseph T., & Son, Inc. 16

Sherritt Gordon Mines, Ltd. 40
Square D Co., Electric Controller & Mfg. Division 78, 79
Steel Equipment Co. 54
Steel Service Center Institute 8
Sun Shipbuilding & Dry Dock Co. 11
Superior Steel Division of Copperweld Steel Co. 45

Textron, Inc. 73
Timken Roller Bearing Co., The .... Back Cover
Transue & Williams 90

Udylite Corporation 74

Wales Strippit, Inc. 84
Wean Engineering Co., Inc., The ..... Inside Back Cover
Wheelco Industrial Instruments Division, Barber-Colman Co. 14, 15
Whiting Corporation 94
Wright Hoist Division, American Chain & Cable Co., Inc. 9

Yoder Co., The 4
Youngstown Foundry & Machine Co., The .. 95

Table of Contents, Page 19

Classified Advertising, Pages 113, 115

Coming

Feb. 27

IN

STEEL

Our Challenge From Nonmetallics

The fourth of 25 installments during 1961 on Profit Growth shows that one part of the profit squeeze problem is increasing competition from nonmetallics — plastics, glass, cement, rubber. Next week, STEEL will give examples of what the competition is doing to metalworking and report on what can be done to offset the losses.

For a free copy of any or all articles in this series, appearing biweekly starting Jan. 16, write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

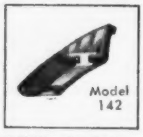
ENGINEERED OIL SEALS for Steel Mills

Garlock KLOZURE* Oil Seals (left) help keep lubrication in, dirt out of roll neck bearing at Inland Steel's East Chicago mill.

Inland Steel applies Garlock KLOZURE Oil Seals for protection of mill roll neck bearings at East Chicago.

Minimizing lubrication leakage from the inboard and outboard ends of the bearings, Garlock KLOZURE Oil Seals provide more constant service as the rolls change position in a lateral movement during operation. Inland finds, too, that in atmospheres of dirt, scale and spray, KLOZURE Oil Seals help keep foreign particles from entering—and damaging—the bearings.

For good, economical bearing protection, Inland joins the growing list of steel producers who use Garlock KLOZURE Oil Seals. Wherever you look in mills, you'll find a specific type of KLOZURE Oil Seals doing a specific job. Model 142, for instance, helps keep water splash and scale out of bearings at the shoulder of mill rolls. Models 64 and 82 protect bearings on back-up and work rolls. Model 53 is recommended for table rolls at normal and high speeds. Model 23 Split KLOZURE is ideal where equipment cannot be dismantled too easily.



Designed for peak efficiency and durability, Garlock KLOZURE Oil Seals resist oil and grease, are impervious to water, mild acids, alkalies, withstand temperatures from −40°F to +250°F. For extreme conditions, Garlock furnishes sealing elements resistant to practically any fluid, and serviceable as high as +500°F.

If you have a particular sealing problem, why not discuss it with your Garlock representative. He's backed by over 70 years of experience in engineering, production and application. Call him at the nearest of the 26 Garlock sales

GARLOCK

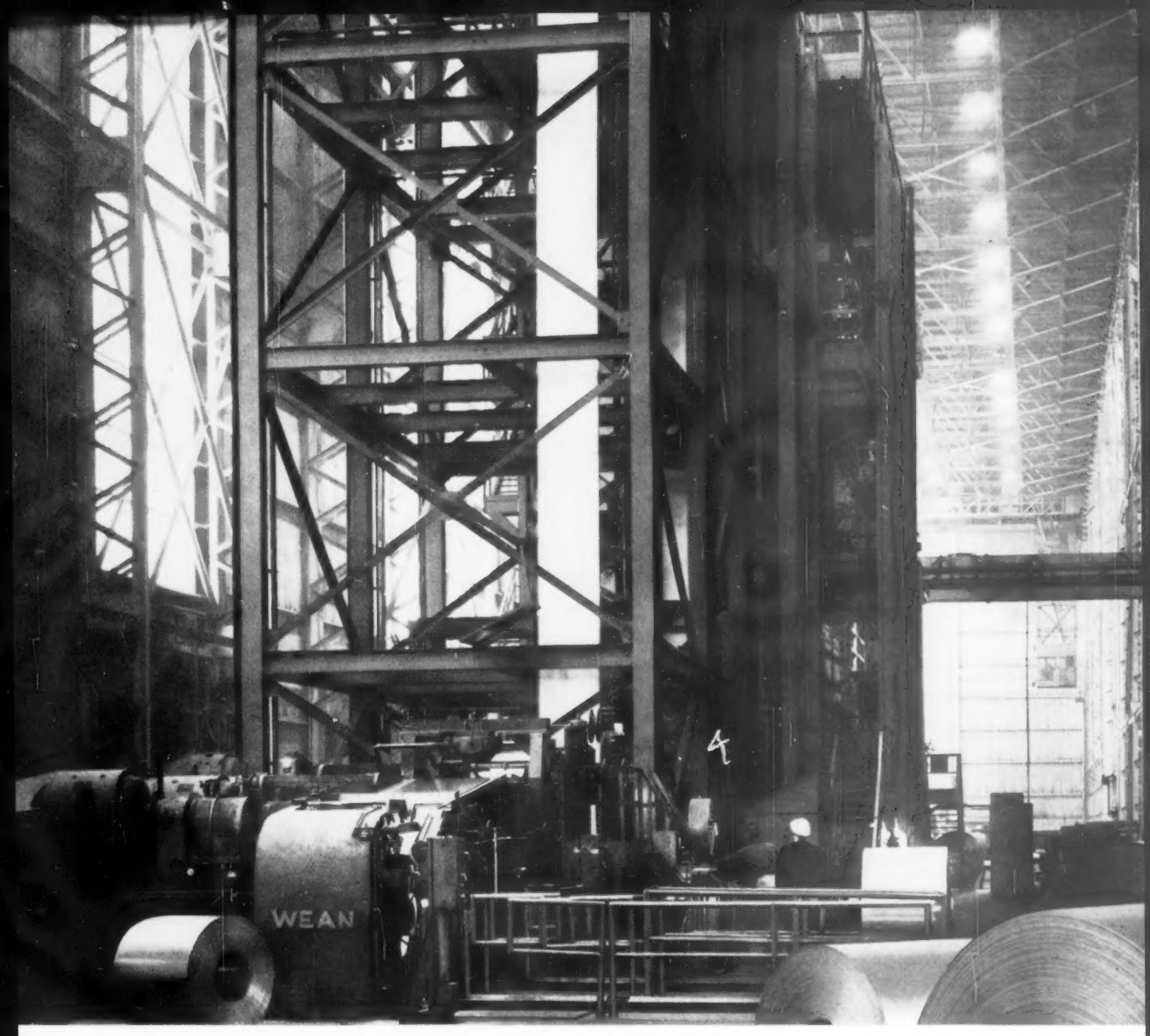
offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-181, Garlock Inc., Palmyra, New York.

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Registered Trademark



Kaiser Steel adds Wean Annealing Line in expansion of West Coast plant

This continuous tin plate annealing line marks the eighth Wean continuous processing facility installed at Kaiser Steel Corporation's Fontana, California plant, to service that company's customers for finished steels on the West Coast.

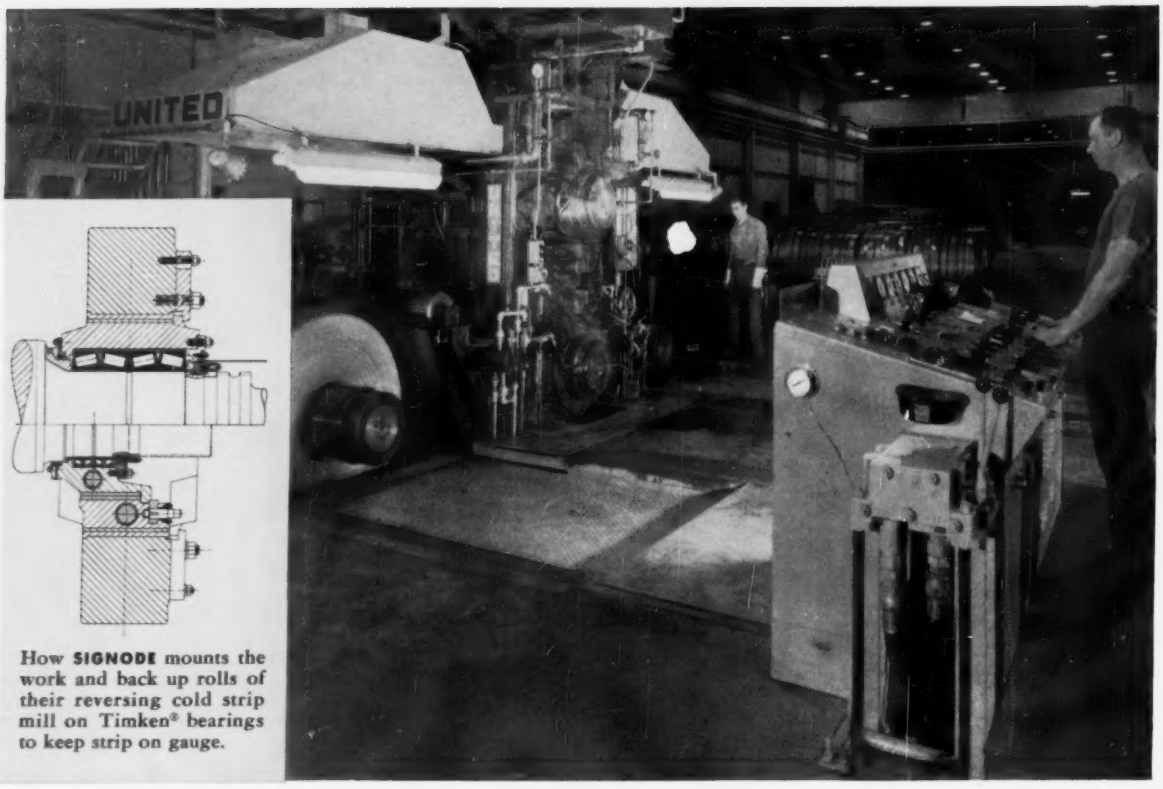
The Fontana line is capable of handling 30,000 lb. coils, with a maximum I.D. of 16½", and an O.D. of 66". Operating at speeds up to 1200 feet per minute, the new line can process strip from .006" to .015" thick, and from 18" to 38" wide.

Other Wean continuous processing equipment at Kaiser's Fontana plant includes a hot strip pickle line, two side trimming and recoiling lines, an electrolytic cleaning line, two electrolytic tinning lines, and a tin plate shearing line.

Wean's "creative engineering" can help you meet your customer requirements.

WEAN

THE WEAN ENGINEERING COMPANY, INC. • WARREN, OHIO



How **SIGNODE** mounts the work and back up rolls of their reversing cold strip mill on Timken® bearings to keep strip on gauge.

Signode's new strip mill controls gauge to .0001" by X-ray Timken® bearings keep it on gauge

THIS new 4-high cold strip mill built by United Engineering & Foundry for Signode Steel Strapping Company has a special X-ray gauge that measures and records strip thickness to .0001". And mounting the work rolls, back up rolls, reel and screw down on Timken® tapered roller bearings helps keep this 11¼" and 29¼" by 20" reversing cold mill turning out strip on gauge—gives Signode maximum economy, assures customers strapping of uniform gauge.

Steel mills the world over use Timken roll neck bearings because they:

1) *Require minimum maintenance.* Timken bearings are tapered and provide the high radial and thrust capacity required by modern steel mill operations.

2) *Give long life.* To make them tough, only the finest bearing-quality alloy steel available is used for Timken bearing rollers and races. In some mills, Timken balanced proportion bearings have rolled over 5,000,000 tons of steel.

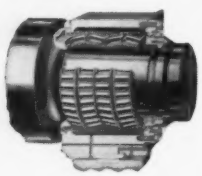
Timken bearings practically eliminate friction, cut starting resistance so that scrap losses are held to a minimum. They can be grease or oil mist lubricated to cut lubricant costs to the bone. It all adds up to the lowest bearing cost per ton of steel rolled. It's why Timken bearings are on the roll necks of 1,008 mills.

Be sure to get all these advantages when you buy or build a mill. Specify Timken tapered roller bearings and get the best in engineering service, the best in bearings. That's Better-ness. Timken bearings are the symbol of Better-ness in machines.

When you buy Timken bearings you get...

1) Quality you can take for granted.
2) Service you can't get anywhere else.
3) The best-known name in bearings.
4) Pace setter in lower bearing costs.

The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ontario.



INDUSTRY rolls on

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